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(54) **SUBSTITUTED N-(TETRAZOL-5-YL)- AND N-(TRIAZOL-5-YL)PYRIDIN-3-YL-CARBOXAMIDE COMPOUNDS AND THEIR USE AS HERBICIDES**

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(58) **Field of Classification Search**

CPC **C07D 401/12**

USPC **546/268.4; 504/261**

See application file for complete search history.

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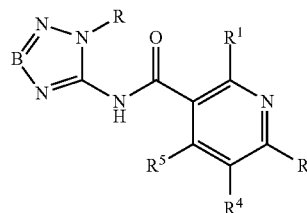
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(57) **ABSTRACT**

N-(tetrazol-5-yl)- and N-(triazol-5-yl)pyridin-3-yl-carboxamides of formula I and their use as herbicides,



The invention relates to N-(tetrazol-5-yl)- and N-(triazol-5-yl)pyridin-3-yl-carboxamides of formula I and their use as herbicides. In said formula I, B represents N or CH, whereas R, R¹, R³, R⁴ and R⁵ represent groups such as hydrogen, halogen or organic groups such as alkyl or phenyl.

17 Claims, No Drawings

I

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**SUBSTITUTED N-(TETRAZOL-5-YL)- AND
N-(TRIAZOL-5-YL)PYRIDIN-3-YL-
CARBOXAMIDE COMPOUNDS AND THEIR
USE AS HERBICIDES**

This application is a National Stage application of International Application No. PCT/EP2013/057819, filed Apr. 15, 2013, which claims the benefit of U.S. Provisional Application No. 61/639,098, filed Apr. 27, 2012, the entire contents of which are hereby incorporated herein by reference.

The present invention relates to substituted N-(tetrazol-5-yl)- and N-(triazol-5-yl)pyridin-3-yl-carboxamide compounds and the N-oxides and salts thereof and to compositions comprising the same. The invention also relates to the use of the N-(tetrazol-5-yl)- and N-(triazol-5-yl)pyridin-3-yl-carboxamide compounds or of the compositions comprising such compounds for controlling unwanted vegetation. Furthermore, the invention relates to methods of applying such compounds.

For the purposes of controlling unwanted vegetation, especially in crops, there is an ongoing need for new herbicides which have high activities and selectivities together with a substantial lack of toxicity for humans and animals.

WO 2011/035874 describes N-(1,2,5-oxadiazol-3-yl)benzamides carrying 3 substituents in the 2-, 3- and 4-positions of the phenyl ring and their use as herbicides.

WO 2012/028579 describes N-(tetrazol-4-yl)- and N-(triazol-3-yl)arylcarboxylic acid amides carrying 3 substituents in the 2-, 3- and 4-positions of the aryl ring and their use as herbicides.

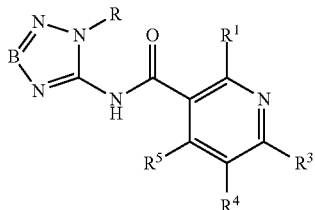
The compounds of the prior art often suffer from insufficient herbicidal activity in particular at low application rates and/or unsatisfactory selectivity resulting in a low compatibility with crop plants.

Accordingly, it is an object of the present invention to provide further N-(tetrazol-5-yl)- and N-(triazol-5-yl)pyridin-3-yl-carboxamide compounds having a strong herbicidal activity, in particular even at low application rates, a sufficiently low toxicity for humans and animals and/or a high compatibility with crop plants. The N-(tetrazol-5-yl)- and N-(triazol-5-yl)pyridin-3-yl-carboxamide compounds should also show a broad activity spectrum against a large number of different unwanted plants.

These and further objectives are achieved by the compounds of formula I defined below and their N-oxides and also their agriculturally suitable salts.

It has been found that the above objectives can be achieved by substituted N-(tetrazol-5-yl)- and N-(triazol-5-yl)pyridin-3-yl-carboxamide compounds of the general formula I, as defined below, including their N-oxides and their salts, in particular their agriculturally suitable salts.

Therefore, in a first aspect the present invention relates to compounds of formula I,



where

B is N or CH;

R is selected from the group consisting of hydrogen, C₁-C₆-alkyl, C₃-C₇-cycloalkyl, C₃-C₇-cycloalkyl-C₁-C₄-alkyl, where the C₃-C₇-cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or

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completely halogenated, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, C₁-C₄-haloalkoxy-C₁-C₄-alkyl, R^b-S(O)_n-C₁-C₃-alkyl, R^c-C(=O)-C₁-C₃-alkyl, R^dO-C(=O)-C₁-C₃-alkyl, R^eR^fN-C(=O)-C₁-C₃-alkyl, R^gR^hN-C₁-C₃-alkyl, phenyl-Z and heterocyclyl-Z, where heterocyclyl is a 5- or 6-membered monocyclic or 8-, 9- or 10-membered bicyclic saturated, partially unsaturated or aromatic heterocycle, which contains 1, 2, 3 or 4 heteroatoms as ring members, which are selected from the group consisting of O, N and S, where phenyl and heterocyclyl are unsubstituted or substituted by 1, 2, 3 or 4 groups R', which are identical or different;

R¹ is selected from the group consisting of cyano-Z¹, halogen, nitro, C₁-C₈-alkyl, C₂-C₈-alkenyl, C₂-C₈-alkynyl, C₁-C₈-haloalkyl, C₁-C₈-alkoxy, C₁-C₄-alkoxy-C₁-C₄-alkyl, C₁-C₄-alkoxy-C₁-C₄-alkoxy-Z¹, C₁-C₄-alkylthio-C₁-C₄-alkyl, C₁-C₄-alkylthio-C₁-C₄-alkylthio-Z¹, C₂-C₆-alkenyl, C₂-C₆-alkynyl, C₁-C₆-haloalkoxy, C₁-C₄-haloalkoxy-C₁-C₄-alkyl, C₁-C₄-haloalkoxy-C₁-C₄-alkoxy-Z¹, R^{1b}-S(O)_k-Z¹, phenoxy-Z¹, and heterocyclyloxy-Z¹, where heterocyclyloxy is an oxygen bound 5- or 6-membered monocyclic or 8-, 9- or 10-membered bicyclic saturated, partially unsaturated or aromatic heterocycle, which contains 1, 2, 3 or 4 heteroatoms as ring members, which are selected from the group consisting of O, N and S, where the cyclic groups in phenoxy and heterocyclyloxy are unsubstituted or substituted by 1, 2, 3 or 4 groups R¹¹, which are identical or different;

R³ is selected from the group consisting of hydrogen, halogen, OH-Z², NO₂-Z², cyano-Z², C₁-C₆-alkyl, C₂-C₈-alkenyl, C₂-C₈-alkynyl, C₃-C₁₀-cycloalkyl-Z², C₃-C₁₀-cycloalkoxy-Z², where the C₃-C₁₀-cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C₁-C₈-haloalkyl, C₁-C₈-alkoxy-Z², C₁-C₈-haloalkoxy-Z², C₁-C₄-alkoxy-C₁-C₄-alkoxy-Z², C₁-C₄-alkylthio-C₁-C₄-alkylthio-Z², C₂-C₈-alkenyl, C₂-C₈-alkynyl, C₁-C₆-haloalkoxy-Z², C₂-C₈-haloalkoxy-Z², C₁-C₄-haloalkoxy-C₁-C₄-alkoxy-Z², R^{2b}-S(O)_k-Z², R^{2c}-C(=O)-Z², R^{2d}O-C(=O)-Z², R^{2e}R^{2f}N-C(=O)-Z², R^{2g}R^{2h}N-Z², phenyl-Z^{2a} and heterocyclyl-Z^{2a}, where heterocyclyl is a 3-, 4-, 5- or 6-membered monocyclic or 8-, 9- or 10-membered bicyclic saturated, partially unsaturated or aromatic heterocycle, which contains 1, 2, 3 or 4 heteroatoms as ring members, which are selected from the group consisting of O, N and S, where the cyclic groups in phenyl-Z^{2a} and heterocyclyl-Z^{2a} are unsubstituted or substituted by 1, 2, 3 or 4 groups R²¹, which are identical or different;

R⁴ is selected from the group consisting of hydrogen, halogen, cyano, nitro, C₁-C₄-alkyl and C₁-C₄-haloalkyl;

R⁵ is selected from the group consisting of hydrogen, halogen, C₁-C₄-alkyl and C₁-C₄-haloalkyl; provided that at least one of the radicals R⁴ and R⁵ is different from hydrogen;

n is 0, 1 or 2;

k is 0, 1 or 2;

R', R¹¹, R²¹ independently of each other are selected from the group consisting of halogen, NO₂, CN, C₁-C₆-alkyl, C₃-C₇-cycloalkyl, C₃-C₇-halocycloalkyl, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, C₁-C₆-alkoxy, C₁-C₄-alkoxy-C₁-C₄-alkyl, C₁-C₄-alkylthio-C₁-C₄-alkyl, C₁-C₄-haloalkoxy-C₁-C₄-alkyl, C₁-C₄-alkoxy-C₁-C₄-alkoxy,

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C₃-C₇-cycloalkoxy and C₁-C₆-haloalkyloxy, or two vicinal radicals R¹, R¹¹ or R²¹ together may form a group =O;

Z, Z¹, Z² independently of each other are selected from the group consisting of a covalent bond and C₁-C₄-alkanediyl;

Z^{2a} is selected from the group consisting of a covalent bond, C₁-C₄-alkanediyl, O—C₁-C₄-alkanediyl, C₁-C₄-alkanediyl-O and C₁-C₄-alkanediyl-O—C₁-C₄-alkanediyl;

R^b, R^{1b}, R^{2b} independently of each other are selected from the group consisting of C₁-C₆-alkyl, C₃-C₇-cycloalkyl, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, phenyl and heterocyclyl, where heterocyclyl is a 5- or 6-membered monocyclic saturated, partially unsaturated or aromatic heterocycle, which contains 1, 2, 3 or 4 heteroatoms as ring members, which are selected from the group consisting of O, N and S, where phenyl and heterocyclyl are unsubstituted or substituted by 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy and C₁-C₄-haloalkoxy;

R^c, R^{2c} independently of each other are selected from the group consisting of hydrogen, C₁-C₆-alkyl, C₃-C₇-cycloalkyl, C₃-C₇-cycloalkyl-C₁-C₄-alkyl, where the C₃-C₇-cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, phenyl, benzyl and heterocyclyl, where heterocyclyl is a 5- or 6-membered monocyclic saturated, partially unsaturated or aromatic heterocycle, which contains 1, 2, 3 or 4 heteroatoms as ring members, which are selected from the group consisting of O, N and S, where phenyl, benzyl and heterocyclyl are unsubstituted or substituted by 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy and C₁-C₄-haloalkoxy;

R^d, R^{2d} independently of each other are selected from the group consisting of C₁-C₆-alkyl, C₃-C₇-cycloalkyl, C₃-C₇-cycloalkyl-C₁-C₄-alkyl, where the C₃-C₇-cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, phenyl and benzyl, where phenyl and benzyl are unsubstituted or substituted by 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy and C₁-C₄-haloalkoxy;

R^e, R^f independently of each other are selected from the group consisting of hydrogen, C₁-C₆-alkyl, C₃-C₇-cycloalkyl, C₃-C₇-cycloalkyl-C₁-C₄-alkyl, where the C₃-C₇-cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, phenyl and benzyl, where phenyl and benzyl are unsubstituted or substituted by 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy and C₁-C₄-haloalkoxy, or

R^e, R^f together with the nitrogen atom, to which they are bound may form a 5-, 6 or 7-membered, saturated or

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unsaturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy and C₁-C₄-haloalkoxy;

R^{2e}, R^{2f} independently of each other have the meanings given for R^e, R^f;

R^g is from the group consisting of hydrogen, C₁-C₆-alkyl, C₃-C₇-cycloalkyl, C₃-C₇-cycloalkyl-C₁-C₄-alkyl, where the C₃-C₇-cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, phenyl and benzyl, where phenyl and benzyl are unsubstituted or substituted by 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy and C₁-C₄-haloalkoxy;

R^h is selected from the group consisting of hydrogen, C₁-C₆-alkyl, C₃-C₇-cycloalkyl, C₃-C₇-cycloalkyl-C₁-C₄-alkyl, where the C₃-C₇-cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, a radical C(=O)—R^k, phenyl and benzyl, where phenyl and benzyl are unsubstituted or substituted by 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy and C₁-C₄-haloalkoxy, or

R^g, R^h together with the nitrogen atom, to which they are bound may form a 5-, 6 or 7-membered, saturated or unsaturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of =O, halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy and C₁-C₄-haloalkoxy;

R^{2g}, R^{2h} independently of each other have the meanings given for R^g, R^h;

R^k has the meanings given for R^c;

an N-oxide or an agriculturally suitable salt thereof.

The compounds of the present invention, i.e. the compounds of formula I, their N-oxides, or their salts are particularly useful for controlling unwanted vegetation. Therefore, the invention also relates to the use of a compound of the present invention, an N-oxide or a salt thereof or of a composition comprising at least one compound of the invention, an N-oxide or an agriculturally suitable salt thereof for combating or controlling unwanted vegetation.

The invention also relates to a composition comprising at least one compound according to the invention, including an N-oxide or a salt thereof, and at least one auxiliary. In particular, the invention relates to an agricultural composition comprising at least one compound according to the invention including an N-oxide or an agriculturally suitable salt thereof, and at least one auxiliary customary for crop protection formulations.

The present invention also relates to a method for combating or controlling unwanted vegetation, which method comprises allowing a herbicidally effective amount of at least one

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compound according to the invention, including an N-oxide or a salt thereof, to act on unwanted plants, their seed and/or their habitat.

Depending on the substitution pattern, the compounds of formula I may have one or more centers of chirality, in which case they are present as mixtures of enantiomers or diastereomers. The invention provides both the pure enantiomers or pure diastereomers of the compounds of formula I, and their mixtures and the use according to the invention of the pure enantiomers or pure diastereomers of the compound of formula I or its mixtures. Suitable compounds of formula I also include all possible geometrical stereoisomers (cis/trans isomers) and mixtures thereof. Cis/trans isomers may be present with respect to an alkene, carbon-nitrogen double-bond, nitrogen-sulfur double bond or amide group. The term “stereoisomer(s)” encompasses both optical isomers, such as enantiomers or diastereomers, the latter existing due to more than one center of chirality in the molecule, as well as geometrical isomers (cis/trans isomers).

Depending on the substitution pattern, the compounds of formula I may be present in the form of their tautomers. Hence the invention also relates to the tautomers of the formula I and the stereoisomers, salts and N-oxides of said tautomers.

The term “N-oxide” includes any compound of the present invention which has at least one tertiary nitrogen atom that is oxidized to an N-oxide moiety. N-oxides in compounds of formula I can in particular be prepared by oxidizing the ring nitrogen atom(s) of the N-(tetrazol-5-yl)- and N-(triazol-5-yl)arylcarboxamide ring with a suitable oxidizing agent, such as peroxy carboxylic acids or other peroxides, or the ring nitrogen atom(s) of a heterocyclic substituent R, R¹ or R³.

The present invention moreover relates to compounds as defined herein, wherein one or more of the atoms depicted in formula I have been replaced by its stable, preferably non-radioactive isotope (e.g., hydrogen by deuterium, ¹²C by ¹³C, ¹⁴N by ¹⁵N, ¹⁶O by ¹⁸O) and in particular wherein at least one hydrogen atom has been replaced by a deuterium atom. Of course, the compounds according to the invention contain more of the respective isotope than this naturally occurs and thus is anyway present in the compounds of formula I.

The compounds of the present invention may be amorphous or may exist in one or more different crystalline states (polymorphs) which may have different macroscopic properties such as stability or show different biological properties such as activities. The present invention includes both amorphous and crystalline compounds of formula I, their enantiomers or diastereomers, mixtures of different crystalline states of the respective compound of formula I, its enantiomers or diastereomers, as well as amorphous or crystalline salts thereof.

Salts of the compounds of the present invention are preferably agriculturally suitable salts. They can be formed in a customary method, e.g. by reacting the compound with an acid if the compound of the present invention has a basic functionality or by reacting the compound with a suitable base if the compound of the present invention has an acidic functionality.

Useful agriculturally suitable salts are especially the salts of those cations or the acid addition salts of those acids whose cations and anions, respectively, do not have any adverse effect on the herbicidal action of the compounds according to the present invention. Suitable cations are in particular the ions of the alkali metals, preferably lithium, sodium and potassium, of the alkaline earth metals, preferably calcium, magnesium and barium, and of the transition metals, preferably manganese, copper, zinc and iron, and also ammonium

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(NH₄⁺) and substituted ammonium in which one to four of the hydrogen atoms are replaced by C₁-C₄-alkyl, C₁-C₄-hydroxyalkyl, C₁-C₄-alkoxy, C₁-C₄-alkoxy-C₁-C₄-alkyl, hydroxy-C₁-C₄-alkoxy-C₁-C₄-alkyl, phenyl or benzyl. Examples of substituted ammonium ions comprise methylammonium, isopropylammonium, dimethylammonium, diisopropylammonium, trimethylammonium, tetramethylammonium, tetraethylammonium, tetrabutylammonium, 2-hydroxyethylammonium, 2-(2-hydroxyethoxy)ethylammonium, bis(2-hydroxyethyl)ammonium, benzyltrimethylammonium and benzyl-triethylammonium, furthermore phosphonium ions, sulfonium ions, preferably tri(C₁-C₄-alkyl)sulfonium, and sulfoxonium ions, preferably tri(C₁-C₄-alkyl)sulfoxonium.

Anions of useful acid addition salts are primarily chloride, bromide, fluoride, hydrogensulfate, sulfate, dihydrogenphosphate, hydrogenphosphate, phosphate, nitrate, bicarbonate, carbonate, hexafluorosilicate, hexafluorophosphate, benzoate, and the anions of C₁-C₄-alkanoic acids, preferably formate, acetate, propionate and butyrate. They can be formed by reacting compounds of the present invention with an acid of the corresponding anion, preferably with hydrochloric acid, hydrobromic acid, sulfuric acid, phosphoric acid or nitric acid.

The term “undesired vegetation” (“weeds”) is understood to include any vegetation growing in non-crop-areas or at a crop plant site or locus of seeded and otherwise desired crop, where the vegetation is any plant species, including their germinant seeds, emerging seedlings and established vegetation, other than the seeded or desired crop (if any). Weeds, in the broadest sense, are plants considered undesirable in a particular location.

The organic moieties mentioned in the above definitions of the variables are—like the term halogen—collective terms for individual listings of the individual group members. The prefix C_n-C_m indicates in each case the possible number of carbon atoms in the group.

The term “halogen” denotes in each case fluorine, bromine, chlorine or iodine, in particular fluorine, chlorine or bromine.

The term “partially or completely halogenated” will be taken to mean that 1 or more, e.g. 1, 2, 3, 4 or 5 or all of the hydrogen atoms of a given radical have been replaced by a halogen atom, in particular by fluorine or chlorine. A partially or completely halogenated radical is termed below also “halo-radical”. For example, partially or completely halogenated alkyl is also termed haloalkyl.

The term “alkyl” as used herein (and in the alkyl moieties of other groups comprising an alkyl group, e.g. alkoxy, alkylcarbonyl, alkoxycarbonyl, alkylthio, alkylsulfonyl and alkoxyalkyl) denotes in each case a straight-chain or branched alkyl group having usually from 1 to 10 carbon atoms, frequently from 1 to 6 carbon atoms, preferably 1 to 4 carbon atoms and in particular from 1 to 3 carbon atoms. Examples of C₁-C₄-alkyl are methyl, ethyl, n-propyl, isopropyl, n-butyl, 2-butyl (sec-butyl), isobutyl and tert-butyl. Examples for C₁-C₆-alkyl are, apart those mentioned for C₁-C₄-alkyl, n-pentyl, 1-methylbutyl, 2-methylbutyl, 3-methylbutyl, 2,2-dimethylpropyl, 1-ethylpropyl, n-hexyl, 1,1-dimethylpropyl, 1,2-dimethylpropyl, 1-methylpentyl, 2-methylpentyl, 3-methylpentyl, 4-methylpentyl, 1,1-dimethylbutyl, 1,2-dimethylbutyl, 1,3-dimethylbutyl, 2,2-dimethylbutyl, 2,3-dimethylbutyl, 3,3-dimethylbutyl, 1-ethylbutyl, 2-ethylbutyl, 1,1,2-trimethylpropyl, 1,2,2-trimethylpropyl, 1-ethyl-1-methylpropyl and 1-ethyl-2-methylpropyl. Examples for C₁-C₁₀-alkyl are, apart those mentioned for C₁-C₆-alkyl, n-heptyl, 1-methylhexyl, 2-methylhexyl, 3-methylhexyl, 4-methylhexyl, 5-methylhexyl, 1-ethylpen-

tyl, 2-ethylpentyl, 3-ethylpentyl, n-octyl, 1-methyloctyl, 2-methylheptyl, 1-ethylhexyl, 2-ethylhexyl, 1,2-dimethylhexyl, 1-propylpentyl, 2-propylpentyl, nonyl, decyl, 2-propylheptyl and 3-propylheptyl.

The term "alkylene" (or alkanediyl) as used herein in each case denotes an alkyl radical as defined above, wherein one hydrogen atom at any position of the carbon backbone is replaced by one further binding site, thus forming a bivalent moiety.

The term "haloalkyl" as used herein (and in the haloalkyl moieties of other groups comprising a haloalkyl group, e.g. haloalkoxy, haloalkylthio, haloalkylcarbonyl, haloalkylsulfonyl and haloalkylsulfinyl) denotes in each case a straight-chain or branched alkyl group having usually from 1 to 8 carbon atoms ("C₁-C₈-haloalkyl"), frequently from 1 to 6 carbon atoms ("C₁-C₆-haloalkyl"), more frequently 1 to 4 carbon atoms ("C₁-C₄-haloalkyl"), wherein the hydrogen atoms of this group are partially or totally replaced with halogen atoms. Preferred haloalkyl moieties are selected from C₁-C₄-haloalkyl, more preferably from C₁-C₂-haloalkyl, more preferably from halomethyl, in particular from C₁-C₂-fluoroalkyl. Halomethyl is methyl in which 1, 2 or 3 of the hydrogen atoms are replaced by halogen atoms. Examples are bromomethyl, chloromethyl, dichloromethyl, trichloromethyl, fluoromethyl, difluoromethyl, trifluoromethyl, chlorofluoromethyl, dichlorofluoromethyl, chlorodifluoromethyl and the like. Examples for C₁-C₂-fluoroalkyl are fluoromethyl, difluoromethyl, trifluoromethyl, 1-fluoroethyl, 2-fluoroethyl, 2,2-difluoroethyl, 2,2,2-trifluoroethyl, pentafluoroethyl, and the like. Examples for C₁-C₂-haloalkyl are, apart those mentioned for C₁-C₂-fluoroalkyl, chloromethyl, dichloromethyl, trichloromethyl, bromomethyl, chlorofluoromethyl, dichlorofluoromethyl, chlorodifluoromethyl, 1-chloroethyl, 2-chloroethyl, 2,2-dichloroethyl, 2,2,2-trichloroethyl, 2-chloro-2-fluoroethyl, 2-chloro-2,2-difluoroethyl, 2,2-dichloro-2-fluoroethyl, 1-bromoethyl, and the like. Examples for C₁-C₄-haloalkyl are, apart those mentioned for C₁-C₂-haloalkyl, 1-fluoropropyl, 2-fluoropropyl, 3-fluoropropyl, 3,3-difluoropropyl, 3,3,3-trifluoropropyl, heptafluoropropyl, 1,1,1-trifluoroprop-2-yl, 3-chloropropyl, 4-chlorobutyl and the like.

The term "cycloalkyl" as used herein (and in the cycloalkyl moieties of other groups comprising a cycloalkyl group, e.g. cycloalkoxy and cycloalkylalkyl) denotes in each case a mono- or bicyclic cycloaliphatic radical having usually from 3 to 10 carbon atoms ("C₃-C₁₀-cycloalkyl"), preferably 3 to 7 carbon atoms ("C₃-C₇-cycloalkyl") or in particular 3 to 6 carbon atoms ("C₃-C₆-cycloalkyl"). Examples of monocyclic radicals having 3 to 6 carbon atoms comprise cyclopropyl, cyclobutyl, cyclopentyl and cyclohexyl. Examples of monocyclic radicals having 3 to 7 carbon atoms comprise cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl and cycloheptyl. Examples of bicyclic radicals having 7 or 8 carbon atoms comprise bicyclo[2.1.1]hexyl, bicyclo[2.2.1]heptyl, bicyclo[3.1.1]heptyl, bicyclo[2.2.1]heptyl, bicyclo[2.2.2]octyl and bicyclo[3.2.1]octyl.

The term "halocycloalkyl" as used herein (and in the halocycloalkyl moieties of other groups comprising a halocycloalkyl group, e.g. halocycloalkylmethyl) denotes in each case a mono- or bicyclic cycloaliphatic radical having usually from 3 to 10 carbon atoms, preferably 3 to 7 carbon atoms or in particular 3 to 6 carbon atoms, wherein at least one, e.g. 1, 2, 3, 4 or 5 of the hydrogen atoms are replaced by halogen, in particular by fluorine or chlorine. Examples are 1- and 2-fluorocyclopropyl, 1,2-, 2,2- and 2,3-difluorocyclopropyl, 1,2,2-trifluorocyclopropyl, 2,2,3,3-tetrafluorocyclopropyl, 1- and 2-chlorocyclopropyl, 1,2-, 2,2- and 2,3-dichlorocyclopropyl,

1,2,2-trichlorocyclopropyl, 2,2,3,3-tetrachlorocyclopropyl, 1-, 2- and 3-fluorocyclopentyl, 1,2-, 2,2-, 2,3-, 3,3-, 3,4-, 2,5-difluorocyclopentyl, 1-, 2- and 3-chlorocyclopentyl, 1,2-, 2,2-, 2,3-, 3,3-, 3,4-, 2,5-dichlorocyclopentyl and the like.

The term "cycloalkyl-alkyl" used herein denotes a cycloalkyl group, as defined above, which is bound to the remainder of the molecule via an alkylene group. The term "C₃-C₇-cycloalkyl-C₁-C₄-alkyl" refers to a C₃-C₇-cycloalkyl group as defined above which is bound to the remainder of the molecule via a C₁-C₄-alkyl group, as defined above. Examples are cyclopropylmethyl, cyclopropylethyl, cyclopropylpropyl, cyclobutylmethyl, cyclobutylethyl, cyclobutylpropyl, cyclopentylmethyl, cyclopentylethyl, cyclopentylpropyl, cyclohexylmethyl, cyclohexylethyl, cyclohexylpropyl, and the like.

The term "alkenyl" as used herein denotes in each case a monounsaturated straight-chain or branched hydrocarbon radical having usually 2 to 8 ("C₂-C₈-alkenyl"), preferably 2 to 6 carbon atoms ("C₂-C₆-alkenyl"), in particular 2 to 4 carbon atoms ("C₂-C₄-alkenyl"), and a double bond in any position, for example C₂-C₄-alkenyl, such as ethenyl, 1-propenyl, 2-propenyl, 1-methylethenyl, 1-butenyl, 2-butenyl, 3-butenyl, 1-methyl-1-propenyl, 2-methyl-1-propenyl, 1-methyl-2-propenyl or 2-methyl-2-propenyl; C₂-C₆-alkenyl, such as ethenyl, 1-propenyl, 2-propenyl, 1-methylethenyl, 1-butenyl, 2-butenyl, 3-butenyl, 1-methyl-1-propenyl, 2-methyl-1-propenyl, 1-methyl-2-propenyl, 2-methyl-2-propenyl, 1-pentenyl, 2-pentenyl, 3-pentenyl, 4-pentenyl, 1-methyl-1-butenyl, 2-methyl-1-butenyl, 3-methyl-1-butenyl, 1-methyl-2-butenyl, 2-methyl-2-butenyl, 3-methyl-2-butenyl, 1-methyl-3-butenyl, 2-methyl-3-butenyl, 3-methyl-3-butenyl, 1,1-dimethyl-2-propenyl, 1,2-dimethyl-1-propenyl, 1,2-dimethyl-2-propenyl, 1-ethyl-1-propenyl, 1-ethyl-2-propenyl, 1-hexenyl, 2-hexenyl, 3-hexenyl, 4-hexenyl, 5-hexenyl, 1-methyl-1-pentenyl, 2-methyl-1-pentenyl, 3-methyl-1-pentenyl, 4-methyl-1-pentenyl, 1-methyl-2-pentenyl, 2-methyl-2-pentenyl, 3-methyl-2-pentenyl, 4-methyl-2-pentenyl, 1-methyl-3-pentenyl, 2-methyl-3-pentenyl, 3-methyl-3-pentenyl, 4-methyl-3-pentenyl, 1-methyl-4-pentenyl, 2-methyl-4-pentenyl, 3-methyl-4-pentenyl, 4-methyl-4-pentenyl, 1,1-dimethyl-2-butenyl, 1,1-dimethyl-3-butenyl, 1,2-dimethyl-1-butenyl, 1,2-dimethyl-2-butenyl, 1,2-dimethyl-3-butenyl, 1,3-dimethyl-1-butenyl, 1,3-dimethyl-2-butenyl, 1,3-dimethyl-3-butenyl, 2,2-dimethyl-3-butenyl, 2,3-dimethyl-1-butenyl, 2,3-dimethyl-2-butenyl, 2,3-dimethyl-3-butenyl, 3,3-dimethyl-1-butenyl, 3,3-dimethyl-2-butenyl, 1-ethyl-1-butenyl, 1-ethyl-2-butenyl, 1-ethyl-3-butenyl, 2-ethyl-1-butenyl, 2-ethyl-2-butenyl, 2-ethyl-3-butenyl, 1,1,2-trimethyl-2-propenyl, 1-ethyl-1-methyl-2-propenyl, 1-ethyl-2-methyl-1-propenyl, 1-ethyl-2-methyl-2-propenyl and the like, or C₂-C₈-alkenyl, such as the radicals mentioned for C₂-C₆-alkenyl and additionally 1-heptenyl, 2-heptenyl, 3-heptenyl, 1-octenyl, 2-octenyl, 3-octenyl, 4-octenyl and the positional isomers thereof.

The term "haloalkenyl" as used herein, which may also be expressed as "alkenyl which is substituted by halogen", and the haloalkenyl moieties in haloalkenyloxy and the like refers to unsaturated straight-chain or branched hydrocarbon radicals having 2 to 8 ("C₂-C₈-haloalkenyl") or 2 to 6 ("C₂-C₆-haloalkenyl") or 2 to 4 ("C₂-C₄-haloalkenyl") carbon atoms and a double bond in any position, where some or all of the hydrogen atoms in these groups are replaced by halogen atoms as mentioned above, in particular fluorine, chlorine and bromine, for example chlorovinyl, chloroallyl and the like.

The term "alkynyl" as used herein denotes unsaturated straight-chain or branched hydrocarbon radicals having usually 2 to 8 ("C₂-C₈-alkynyl"), frequently 2 to 6 ("C₂-C₆-

alkynyl”), preferably 2 to 4 carbon atoms (“C₂-C₄-alkynyl”) and a triple bond in any position, for example C₂-C₄-alkynyl, such as ethynyl, 1-propynyl, 2-propynyl, 1-butylnyl, 2-butylnyl, 3-butylnyl, 1-methyl-2-propynyl and the like, C₂-C₆-alkynyl, such as ethynyl, 1-propynyl, 2-propynyl, 1-butylnyl, 2-butylnyl, 3-butylnyl, 1-methyl-2-propynyl, 1-pentylnyl, 2-pentylnyl, 3-pentylnyl, 4-pentylnyl, 1-methyl-2-butylnyl, 1-methyl-3-butylnyl, 2-methyl-3-butylnyl, 3-methyl-1-butylnyl, 1,1-dimethyl-2-propynyl, 1-ethyl-2-propynyl, 1-hexylnyl, 2-hexylnyl, 3-hexylnyl, 4-hexylnyl, 5-hexylnyl, 1-methyl-2-pentylnyl, 1-methyl-3-pentylnyl, 1-methyl-4-pentylnyl, 2-methyl-3-pentylnyl, 2-methyl-4-pentylnyl, 3-methyl-1-pentylnyl, 3-methyl-4-pentylnyl, 4-methyl-1-pentylnyl, 4-methyl-2-pentylnyl, 1,1-dimethyl-2-butylnyl, 1,1-dimethyl-3-butylnyl, 1,2-dimethyl-3-butylnyl, 2,2-dimethyl-3-butylnyl, 3,3-dimethyl-1-butylnyl, 1-ethyl-2-butylnyl, 1-ethyl-3-butylnyl, 2-ethyl-3-butylnyl, 1-ethyl-1-methyl-2-propynyl and the like.

The term “haloalkynyl” as used herein, which is also expressed as “alkynyl which is substituted by halogen”, refers to unsaturated straight-chain or branched hydrocarbon radicals having usually 2 to 8 carbon atoms (“C₂-C₈-haloalkynyl”), frequently 2 to 6 (“C₂-C₆-haloalkynyl”), preferably 2 to 4 carbon atoms (“C₂-C₄-haloalkynyl”), and a triple bond in any position (as mentioned above), where some or all of the hydrogen atoms in these groups are replaced by halogen atoms as mentioned above, in particular fluorine, chlorine and bromine.

The term “alkoxy” as used herein denotes in each case a straight-chain or branched alkyl group usually having from 1 to 8 carbon atoms (“C₁-C₈-alkoxy”), frequently from 1 to 6 carbon atoms (“C₁-C₆-alkoxy”), preferably 1 to 4 carbon atoms (“C₁-C₄-alkoxy”), which is bound to the remainder of the molecule via an oxygen atom. C₁-C₂-Alkoxy is methoxy or ethoxy. C₁-C₄-Alkoxy is additionally, for example, n-propoxy, 1-methylethoxy (isopropoxy), butoxy, 1-methylpropoxy (sec-butoxy), 2-methylpropoxy (isobutoxy) or 1,1-dimethylethoxy (tert-butoxy). C₁-C₆-Alkoxy is additionally, for example, pentoxy, 1-methylbutoxy, 2-methylbutoxy, 3-methylbutoxy, 1,1-dimethylpropoxy, 1,2-dimethylpropoxy, 2,2-dimethylpropoxy, 1-ethylpropoxy, hexoxy, 1-methylpentoxy, 2-methylpentoxy, 3-methylpentoxy, 4-methylpentoxy, 1,1-dimethylbutoxy, 1,2-dimethylbutoxy, 1,3-dimethylbutoxy, 2,2-dimethylbutoxy, 2,3-dimethylbutoxy, 3,3-dimethylbutoxy, 1-ethylbutoxy, 2-ethylbutoxy, 1,1,2-trimethylpropoxy, 1,2,2-trimethylpropoxy, 1-ethyl-1-methylpropoxy or 1-ethyl-2-methylpropoxy. C₁-C₈-Alkoxy is additionally, for example, heptyloxy, octyloxy, 2-ethylhexyloxy and positional isomers thereof.

The term “haloalkoxy” as used herein denotes in each case a straight-chain or branched alkoxy group, as defined above, having from 1 to 8 carbon atoms (“C₁-C₈-haloalkoxy”), frequently from 1 to 6 carbon atoms (“C₁-C₆-haloalkoxy”), preferably 1 to 4 carbon atoms (“C₁-C₄-haloalkoxy”), more preferably 1 to 3 carbon atoms (“C₁-C₃-haloalkoxy”), wherein the hydrogen atoms of this group are partially or totally replaced with halogen atoms, in particular fluorine atoms. C₁-C₂-Haloalkoxy is, for example, OCH₂F, OCHF₂, OCF₃, OCH₂Cl, OCHCl₂, OCCl₃, chlorodifluoromethoxy, dichlorodifluoromethoxy, chlorodifluoromethoxy, 2-fluoroethoxy, 2-chloroethoxy, 2-bromoethoxy, 2-iodoethoxy, 2,2-difluoroethoxy, 2,2,2-trifluoroethoxy, 2-chloro-2-fluoroethoxy, 2-chloro-2,2-difluoroethoxy, 2,2-dichloro-2-fluoroethoxy, 2,2,2-trichloroethoxy or OC₂F₅. C₁-C₄-Haloalkoxy is additionally, for example, 2-fluoropropoxy, 3-fluoropropoxy, 2,2-difluoropropoxy, 2,3-difluoropropoxy, 2-chloropropoxy, 3-chloropropoxy, 2,3-dichloropropoxy, 2-bromopropoxy, 3-bromopropoxy, 3,3,3-trifluoropropoxy, 3,3,3-trichloropropoxy,

poxy, OCH₂-C₂F₅, OCF₂-C₂F₅, 1-(CH₂F)-2-fluoroethoxy, 1-(CH₂Cl)-2-chloroethoxy, 1-(CH₂Br)-2-bromoethoxy, 4-fluorobutoxy, 4-chlorobutoxy, 4-bromobutoxy or nonafluorobutoxy. C₁-C₆-Haloalkoxy is additionally, for example, 5-fluoropentoxy, 5-chloropentoxy, 5-bromopentoxy, 5-iodopentoxy, undecafluoropentoxy, 6-fluorohexoxy, 6-chlorohexoxy, 6-bromohexoxy, 6-iodohexoxy or dodecafluorohexoxy.

The term “alkoxyalkyl” as used herein denotes in each case alkyl usually comprising 1 to 6 carbon atoms, preferably 1 to 4 carbon atoms, wherein 1 carbon atom carries an alkoxy radical usually comprising 1 to 8, frequently 1 to 6, in particular 1 to 4, carbon atoms as defined above. “C₁-C₆-alkoxy-C₁-C₆-alkyl” is a C₁-C₆-alkyl group, as defined above, in which one hydrogen atom is replaced by a C₁-C₆-alkoxy group, as defined above. Examples are CH₂OCH₃, CH₂-OC₂H₅, n-propoxymethyl, CH₂-OCH(CH₃)₂, n-butoxymethyl, (1-methylpropoxy)-methyl, (2-methylpropoxy)-methyl, CH₂-OC(CH₃)₃, 2-(methoxy)ethyl, 2-(ethoxy)ethyl, 2-(n-propoxy)-ethyl, 2-(1-methylethoxy)-ethyl, 2-(n-butoxy)-ethyl, 2-(1-methylpropoxy)-ethyl, 2-(2-methylpropoxy)-ethyl, 2-(1,1-dimethylethoxy)-ethyl, 2-(methoxy)-propyl, 2-(ethoxy)-propyl, 2-(n-propoxy)-propyl, 2-(1-methylethoxy)-propyl, 2-(n-butoxy)-propyl, 2-(1-methylpropoxy)-propyl, 2-(2-methylpropoxy)-propyl, 2-(1,1-dimethylethoxy)-propyl, 3-(methoxy)-propyl, 3-(ethoxy)-propyl, 3-(n-propoxy)-propyl, 3-(1-methylethoxy)-propyl, 3-(n-butoxy)-propyl, 3-(1-methylpropoxy)-propyl, 3-(2-methylpropoxy)-propyl, 3-(1,1-dimethylethoxy)-propyl, 2-(methoxy)-butyl, 2-(ethoxy)-butyl, 2-(n-propoxy)-butyl, 2-(1-methylethoxy)-butyl, 2-(n-butoxy)-butyl, 2-(1-methylpropoxy)-butyl, 2-(2-methylpropoxy)-butyl, 2-(1,1-dimethylethoxy)-butyl, 3-(methoxy)-butyl, 3-(ethoxy)-butyl, 3-(n-propoxy)-butyl, 3-(1-methylethoxy)-butyl, 3-(n-butoxy)-butyl, 3-(1-methylpropoxy)-butyl, 3-(2-methylpropoxy)-butyl, 3-(1,1-dimethylethoxy)-butyl, 4-(methoxy)-butyl, 4-(ethoxy)-butyl, 4-(n-propoxy)-butyl, 4-(1-methylethoxy)-butyl, 4-(n-butoxy)-butyl, 4-(1-methylpropoxy)-butyl, 4-(2-methylpropoxy)-butyl, 4-(1,1-dimethylethoxy)-butyl and the like.

The term “haloalkoxy-alkyl” as used herein denotes in each case alkyl as defined above, usually comprising 1 to 6 carbon atoms, preferably 1 to 4 carbon atoms, wherein 1 carbon atom carries an haloalkoxy radical as defined above, usually comprising 1 to 8, frequently 1 to 6, in particular 1 to 4, carbon atoms as defined above. Examples are fluoromethoxymethyl, difluoromethoxymethyl, trifluoromethoxymethyl, 1-fluoroethoxymethyl, 2-fluoroethoxymethyl, 1,1-difluoroethoxymethyl, 1,2-difluoroethoxymethyl, 2,2-difluoroethoxymethyl, 1,1,2-trifluoroethoxymethyl, 1,2,2-trifluoroethoxymethyl, 2,2,2-trifluoroethoxymethyl, pentafluoroethoxymethyl, 1-fluoroethoxy-1-ethyl, 2-fluoroethoxy-1-ethyl, 1,1-difluoroethoxy-1-ethyl, 1,2-difluoroethoxy-1-ethyl, 2,2-difluoroethoxy-1-ethyl, 1,1,2-trifluoroethoxy-1-ethyl, 1,2,2-trifluoroethoxy-1-ethyl, 2,2,2-trifluoroethoxy-1-ethyl, pentafluoroethoxy-1-ethyl, 1-fluoroethoxy-2-ethyl, 2-fluoroethoxy-2-ethyl, 1,1-difluoroethoxy-2-ethyl, 1,2-difluoroethoxy-2-ethyl, 2,2-difluoroethoxy-2-ethyl, 1,1,2-trifluoroethoxy-2-ethyl, 1,2,2-trifluoroethoxy-2-ethyl, 2,2,2-trifluoroethoxy-2-ethyl, pentafluoroethoxy-2-ethyl, and the like.

The term “alkylthio” (also alkylsulfanyl, “alkyl-S” or “alkyl-S(O)_k” (wherein k is 0)) as used herein denotes in each case a straight-chain or branched saturated alkyl group as defined above, usually comprising 1 to 8 carbon atoms (“C₁-C₈-alkylthio”), frequently comprising 1 to 6 carbon atoms (“C₁-C₆-alkylthio”), preferably 1 to 4 carbon atoms (“C₁-C₄-

alkylthio”), which is attached via a sulfur atom at any position in the alkyl group. C₁-C₂-Alkylthio is methylthio or ethylthio. C₁-C₄-Alkylthio is additionally, for example, n-propylthio, 1-methylethylthio (isopropylthio), butylthio, 1-methylpropylthio (sec-butylthio), 2-methylpropylthio (isobutylthio) or 1,1-dimethylethylthio (tert-butylthio). C₁-C₆-Alkylthio is additionally, for example, pentylthio, 1-methylbutylthio, 2-methylbutylthio, 3-methylbutylthio, 1,1-dimethylpropylthio, 1,2-dimethylpropylthio, 2,2-dimethylpropylthio, 1-ethylpropylthio, hexylthio, 1-methylpentylthio, 2-methylpentylthio, 3-methylpentylthio, 4-methylpentylthio, 1,1-dimethylbutylthio, 1,2-dimethylbutylthio, 1,3-dimethylbutylthio, 2,2-dimethylbutylthio, 2,3-dimethylbutylthio, 3,3-dimethylbutylthio, 1-ethylbutylthio, 2-ethylbutylthio, 1,1,2-trimethylpropylthio, 1,2,2-trimethylpropylthio, 1-ethyl-1-methylpropylthio or 1-ethyl-2-methylpropylthio. C₁-C₆-Alkylthio is additionally, for example, heptylthio, octylthio, 2-ethylhexylthio and positional isomers thereof.

The term “haloalkylthio” as used herein refers to an alkylthio group as defined above wherein the hydrogen atoms are partially or completely substituted by fluorine, chlorine, bromine and/or iodine. C₁-C₂-Haloalkylthio is, for example, SCH₂F, SCH₂Cl, SCF₃, SCH₂Cl, SCHCl₂, SCl₃, chlorofluoromethylthio, dichlorofluoromethylthio, chlorodifluoromethylthio, 2-fluoroethylthio, 2-chloroethylthio, 2-bromoethylthio, 2-iodoethylthio, 2,2-difluoroethylthio, 2,2,2-trifluoroethylthio, 2-chloro-2-fluoroethylthio, 2-chloro-2,2-difluoroethylthio, 2,2-dichloro-2-fluoroethylthio, 2,2,2-trichloroethylthio or SC₂F₅. C₁-C₄-Haloalkylthio is additionally, for example, 2-fluoropropylthio, 3-fluoropropylthio, 2,2-difluoropropylthio, 2,3-difluoropropylthio, 2-chloropropylthio, 3-chloropropylthio, 2,3-dichloropropylthio, 2-bromopropylthio, 3-bromopropylthio, 3,3,3-trifluoropropylthio, 3,3,3-trichloropropylthio, SCH₂-C₂F₅, SCF₂-C₂F₅, 1-(CH₂F)-2-fluoroethylthio, 1-(CH₂Cl)-2-chloroethylthio, 1-(CH₂Br)-2-bromoethylthio, 4-fluorobutylthio, 4-chlorobutylthio, 4-bromobutylthio or nonafluorobutylthio. C₁-C₆-Haloalkylthio is additionally, for example, 5-fluoropentylthio, 5-chloropentylthio, 5-bromopentylthio, 5-iodopentylthio, undecafluoropentylthio, 6-fluorohexylthio, 6-chlorohexylthio, 6-bromohexylthio, 6-iodohexylthio or dodecafluorohexylthio.

The terms “alkylsulfinyl” and “alkyl-S(O)_k” (wherein k is 1) are equivalent and, as used herein, denote an alkyl group, as defined above, attached via a sulfinyl [S(O)] group. For example, the term “C₁-C₂-alkylsulfinyl” refers to a C₁-C₂-alkyl group, as defined above, attached via a sulfinyl [S(O)] group. The term “C₁-C₄-alkylsulfinyl” refers to a C₁-C₄-alkyl group, as defined above, attached via a sulfinyl [S(O)] group. The term “C₁-C₆-alkylsulfinyl” refers to a C₁-C₆-alkyl group, as defined above, attached via a sulfinyl [S(O)] group. C₁-C₂-alkylsulfinyl is methylsulfinyl or ethylsulfinyl. C₁-C₄-alkylsulfinyl is additionally, for example, n-propylsulfinyl, 1-methylethylsulfinyl (isopropylsulfinyl), butylsulfinyl, 1-methylpropylsulfinyl (sec-butylsulfinyl), 2-methylpropylsulfinyl (isobutylsulfinyl) or 1,1-dimethylethylsulfinyl (tert-butylsulfinyl). C₁-C₆-alkylsulfinyl is additionally, for example, pentylsulfinyl, 1-methylbutylsulfinyl, 2-methylbutylsulfinyl, 3-methylbutylsulfinyl, 1,1-dimethylpropylsulfinyl, 1,2-dimethylpropylsulfinyl, 2,2-dimethylpropylsulfinyl, 1-ethylpropylsulfinyl, hexylsulfinyl, 1-methylpentylsulfinyl, 2-methylpentylsulfinyl, 3-methylpentylsulfinyl, 4-methylpentylsulfinyl, 1,1-dimethylbutylsulfinyl, 1,2-dimethylbutylsulfinyl, 1,3-dimethylbutylsulfinyl, 2,2-dimethylbutylsulfinyl, 2,3-dimethylbutylsulfinyl, 3,3-dimethylbutylsulfinyl, 1-ethylbutylsulfinyl, 2-ethylbutylsulfinyl, 1,1,2-trimethyl-

propylsulfinyl, 1,2,2-trimethylpropylsulfinyl, 1-ethyl-1-methylpropylsulfinyl or 1-ethyl-2-methylpropylsulfinyl.

The terms “alkylsulfonyl” and “alkyl-S(O)_k” (wherein k is 2) are equivalent and, as used herein, denote an alkyl group, as defined above, attached via a sulfonyl [S(O)₂] group. The term “C₁-C₂-alkylsulfonyl” refers to a C₁-C₂-alkyl group, as defined above, attached via a sulfonyl [S(O)₂] group. The term “C₁-C₄-alkylsulfonyl” refers to a C₁-C₄-alkyl group, as defined above, attached via a sulfonyl [S(O)₂] group. The term “C₁-C₆-alkylsulfonyl” refers to a C₁-C₆-alkyl group, as defined above, attached via a sulfonyl [S(O)₂] group. C₁-C₂-alkylsulfonyl is methylsulfonyl or ethylsulfonyl. C₁-C₄-alkylsulfonyl is additionally, for example, n-propylsulfonyl, 1-methylethylsulfonyl (isopropylsulfonyl), butylsulfonyl, 1-methylpropylsulfonyl (secbutylsulfonyl), 2-methylpropylsulfonyl (isobutylsulfonyl) or 1,1-dimethylethylsulfonyl (tert-butylsulfonyl). C₁-C₆-alkylsulfonyl is additionally, for example, pentylsulfonyl, 1-methylbutylsulfonyl, 2-methylbutylsulfonyl, 3-methylbutylsulfonyl, 1,1-dimethylpropylsulfonyl, 1,2-dimethylpropylsulfonyl, 2,2-dimethylpropylsulfonyl, 1-ethylpropylsulfonyl, hexylsulfonyl, 1-methylpentylsulfonyl, 2-methylpentylsulfonyl, 3-methylpentylsulfonyl, 4-methylpentylsulfonyl, 1,1-dimethylbutylsulfonyl, 1,2-dimethylbutylsulfonyl, 1,3-dimethylbutylsulfonyl, 2,2-dimethylbutylsulfonyl, 2,3-dimethylbutylsulfonyl, 3,3-dimethylbutylsulfonyl, 1-ethylbutylsulfonyl, 2-ethylbutylsulfonyl, 1,1,2-trimethylpropylsulfonyl, 1,2,2-trimethylpropylsulfonyl, 1-ethyl-1-methylpropylsulfonyl or 1-ethyl-2-methylpropylsulfonyl.

The term “alkylamino” as used herein denotes in each case a group R*HN—, wherein R* is a straight-chain or branched alkyl group usually having from 1 to 6 carbon atoms (“C₁-C₆-alkylamino”), preferably 1 to 4 carbon atoms (“C₁-C₄-alkylamino”). Examples of C₁-C₆-alkylamino are methylamino, ethylamino, n-propylamino, isopropylamino, n-butylamino, 2-butylamino, isobutylamino, tert-butylamino, and the like.

The term “dialkylamino” as used herein denotes in each case a group R*R’N—, wherein R* and R’, independently of each other, are a straight-chain or branched alkyl group each usually having from 1 to 6 carbon atoms (“di-(C₁-C₆-alkyl)-amino”), preferably 1 to 4 carbon atoms (“di-(C₁-C₄-alkyl)-amino”). Examples of a di-(C₁-C₆-alkyl)-amino group are dimethylamino, diethylamino, dipropylamino, dibutylamino, methyl-ethyl-amino, methyl-propyl-amino, methyl-isopropylamino, methyl-butyl-amino, methyl-isobutyl-amino, ethyl-propyl-amino, ethyl-isopropylamino, ethyl-butyl-amino, ethyl-isobutyl-amino, and the like.

The suffix “-carbonyl” in a group denotes in each case that the group is bound to the remainder of the molecule via a carbonyl C=O group. This is the case e.g. in alkylcarbonyl, haloalkylcarbonyl, aminocarbonyl, alkylaminocarbonyl, dialkylaminocarbonyl, alkoxy carbonyl, haloalkoxy carbonyl.

The term “aryl” as used herein refers to a mono-, bi- or tricyclic aromatic hydrocarbon radical such as phenyl or naphthyl, in particular phenyl.

The term “het(ero)aryl” as used herein refers to a mono-, bi- or tricyclic heteroaromatic hydrocarbon radical, preferably to a monocyclic heteroaromatic radical, such as pyridyl, pyrimidyl and the like.

The term “3-, 4-, 5- or 6-membered monocyclic or 8-, 9- or 10-membered bicyclic saturated, unsaturated or aromatic heterocycle containing 1, 2, 3 or 4 heteroatoms as ring members selected from the groups consisting of N, O and S” as used herein denotes monocyclic or bicyclic radicals, the monocyclic or bicyclic radicals being saturated, unsaturated or aromatic where N can optionally be oxidized, i.e. in the form of

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an N-oxide, and S can also optionally be oxidized to various oxidation states, i.e. as SO or SO₂. An unsaturated heterocycle contains at least one C—C and/or C—N and/or N—N double bond(s). A fully unsaturated heterocycle contains as many conjugated C—C and/or C—N and/or N—N double bonds as allowed by the size(s) of the ring(s). An aromatic monocyclic heterocycle is a fully unsaturated 5- or 6-membered monocyclic heterocycle. An aromatic bicyclic heterocycle is an 8-, 9- or 10-membered bicyclic heterocycle consisting of a 5- or 6-membered heteroaromatic ring which is fused to a phenyl ring or to another 5- or 6-membered heteroaromatic ring. The heterocycle may be attached to the remainder of the molecule via a carbon ring member or via a nitrogen ring member. As a matter of course, the heterocyclic ring contains at least one carbon ring atom. If the ring contains more than one O ring atom, these are not adjacent.

Examples of a 3-, 4-, 5- or 6-membered monocyclic saturated heterocycle include: oxirane-2-yl, aziridine-1-yl, aziridine-2-yl, oxetan-2-yl, azetidine-1-yl, azetidine-2-yl, azetidine-3-yl, thietane-1-yl, thietan-2-yl, thietane-3-yl, tetrahydrofuran-2-yl, tetrahydrofuran-3-yl, tetrahydrothien-2-yl, tetrahydrothien-3-yl, pyrrolidin-1-yl, pyrrolidin-2-yl, pyrrolidin-3-yl, pyrazolidin-1-yl, pyrazolidin-3-yl, pyrazolidin-4-yl, pyrazolidin-5-yl, imidazolidin-1-yl, imidazolidin-2-yl, imidazolidin-4-yl, oxazolidin-2-yl, oxazolidin-3-yl, oxazolidin-4-yl, oxazolidin-5-yl, isoxazolidin-2-yl, isoxazolidin-3-yl, isoxazolidin-4-yl, isoxazolidin-5-yl, thiazolidin-2-yl, thiazolidin-3-yl, thiazolidin-4-yl, thiazolidin-5-yl, isothiazolidin-2-yl, isothiazolidin-3-yl, isothiazolidin-4-yl, isothiazolidin-5-yl, 1,2,4-oxadiazolidin-3-yl, 1,2,4-oxadiazolidin-5-yl, 1,2,4-thiadiazolidin-3-yl, 1,2,4-thiadiazolidin-5-yl, 1,2,4-triazolidin-3-yl, 1,3,4-oxadiazolidin-2-yl, 1,3,4-thiadiazolidin-2-yl, 1,3,4-triazolidin-1-yl, 1,3,4-triazolidin-2-yl, 2-tetrahydropyran-1-yl, 4-tetrahydropyran-1-yl, 1,3-dioxan-5-yl, 1,4-dioxan-2-yl, piperidin-1-yl, piperidin-2-yl, piperidin-3-yl, piperidin-4-yl, hexahydro-pyridazin-3-yl, hexahydro-pyridazin-4-yl, hexahydropyrimidin-2-yl, hexahydropyrimidin-4-yl, hexahydropyrimidin-5-yl, piperazin-1-yl, piperazin-2-yl, 1,3,5-hexahydrotriazin-1-yl, 1,3,5-hexahydrotriazin-2-yl and 1,2,4-hexahydrotriazin-3-yl, morpholin-2-yl, morpholin-3-yl, morpholin-4-yl, thiomorpholin-2-yl, thiomorpholin-3-yl, thiomorpholin-4-yl, 1-oxothiomorpholin-2-yl, 1-oxothiomorpholin-3-yl, 1-oxothiomorpholin-4-yl, 1,1-dioxothiomorpholin-2-yl, 1,1-dioxothiomorpholin-3-yl, 1,1-dioxothiomorpholin-4-yl and the like.

Examples of a 5- or 6-membered monocyclic partially unsaturated heterocycle include 2,3-dihydrofuran-2-yl, 2,3-dihydrofuran-3-yl, 2,4-dihydrofuran-2-yl, 2,4-dihydrofuran-3-yl, 2,3-dihydrothien-2-yl, 2,3-dihydrothien-3-yl, 2,4-dihydrothien-2-yl, 2,4-dihydrothien-3-yl, 2-pyrrolin-2-yl, 2-pyrrolin-3-yl, 3-pyrrolin-2-yl, 3-pyrrolin-3-yl, 2-isoxazolin-3-yl, 3-isoxazolin-3-yl, 4-isoxazolin-3-yl, 2-isoxazolin-4-yl, 3-isoxazolin-4-yl, 4-isoxazolin-4-yl, 2-isoxazolin-5-yl, 3-isoxazolin-5-yl, 4-isoxazolin-5-yl, 2-isothiazolin-3-yl, 3-isothiazolin-3-yl, 4-isothiazolin-3-yl, 2-isothiazolin-4-yl, 3-isothiazolin-4-yl, 4-isothiazolin-4-yl, 2-isothiazolin-5-yl, 3-isothiazolin-5-yl, 4-isothiazolin-5-yl, 2,3-dihydropyrazol-1-yl, 2,3-dihydropyrazol-2-yl, 2,3-dihydropyrazol-3-yl, 2,3-dihydropyrazol-4-yl, 2,3-dihydropyrazol-5-yl, 3,4-dihydropyrazol-1-yl, 3,4-dihydropyrazol-3-yl, 3,4-dihydropyrazol-4-yl, 3,4-dihydropyrazol-5-yl, 4,5-dihydropyrazol-1-yl, 4,5-dihydropyrazol-3-yl, 4,5-dihydropyrazol-4-yl, 4,5-dihydropyrazol-5-yl, 2,3-dihydrooxazol-2-yl, 2,3-dihydrooxazol-3-yl, 2,3-dihydrooxazol-4-yl, 2,3-dihydrooxazol-5-yl, 3,4-dihydrooxazol-2-yl, 3,4-dihydrooxazol-3-yl, 3,4-

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dihydrooxazol-4-yl, 3,4-dihydrooxazol-5-yl, 3,4-dihydrooxazol-2-yl, 3,4-dihydrooxazol-3-yl, 3,4-dihydrooxazol-4-yl, 2-, 3-, 4-, 5- or 6-di- or tetrahydropyridinyl, 3-di- or tetrahydro-pyridazinyl, 4-di- or tetrahydro-pyridazinyl, 2-di- or tetrahydropyrimidinyl, 4-di- or tetrahydropyrimidinyl, 5-di- or tetrahydropyrimidinyl, di- or tetrahydropyrazinyl, 1,3,5-di- or tetrahydrotriazin-2-yl and 1,2,4-di- or tetrahydrotriazin-3-yl.

A 5- or 6-membered monocyclic fully unsaturated (including aromatic) heterocyclic ring is e.g. a 5- or 6-membered monocyclic fully unsaturated (including aromatic) heterocyclic ring. Examples are: 2-furyl, 3-furyl, 2-thienyl, 3-thienyl, 1-pyrrolyl, 2-pyrrolyl, 3-pyrrolyl, 1-pyrazolyl, 3-pyrazolyl, 4-pyrazolyl, 5-pyrazolyl, 2-oxazolyl, 4-oxazolyl, 5-oxazolyl, 2-thiazolyl, 4-thiazolyl, 5-thiazolyl, 1-imidazolyl, 2-imidazolyl, 4-imidazolyl, 1,3,4-triazol-1-yl, 1,3,4-triazol-2-yl, 2-pyridinyl, 3-pyridinyl, 4-pyridinyl, 1-oxopyridin-2-yl, 1-oxopyridin-3-yl, 1-oxopyridin-4-yl, 3-pyridazinyl, 4-pyridazinyl, 2-pyrimidinyl, 4-pyrimidinyl, 5-pyrimidinyl and 2-pyrazinyl.

Examples of a 5- or 6-membered heteroaromatic ring fused to a phenyl ring or to a 5- or 6-membered heteroaromatic radical include benzofuranyl, benzothieryl, indolyl, indazolyl, benzimidazolyl, benzoxathiazolyl, benzoxadiazolyl, benzothiadiazolyl, benzoxazinyl, chinolyl, isochinolyl, purinyl, 1,8-naphthyridyl, pteridyl, pyrido[3,2-d]pyrimidyl or pyridoimidazolyl and the like.

If two radicals bound on the same nitrogen atom (for example R^e and R^f or R^{2e} and R^{2f} or R^g and R^h or R^{2g} and R^{2h}) together with the nitrogen atom, to which they are bound, form a 5-, 6 or 7-membered, saturated or unsaturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N, this is for example pyrrolidine-1-yl, pyrazolidin-1-yl, imidazolidin-1-yl, oxazolidin-3-yl, thiazolidin-3-yl, isoxazolidin-2-yl, isothiazolidin-2-yl, [1,2,3]-triazolidin-1-yl, [1,2,3]-triazolidin-2-yl, [1,2,4]-triazolidin-1-yl, [1,2,4]-triazolidin-4-yl, [1,2,3]oxadiazolidin-2-yl, [1,2,3]oxadiazolidin-3-yl, [1,2,5]oxadiazolidin-2-yl, [1,2,4]oxadiazolidin-2-yl, [1,2,4]oxadiazolidin-4-yl, [1,3,4]oxadiazolidin-3-yl, [1,2,3]-thiadiazolidin-2-yl, [1,2,3]-thiadiazolidin-3-yl, [1,2,5]-thiadiazolidin-2-yl, [1,2,4]-thiadiazolidin-2-yl, [1,2,4]-thiadiazolidin-4-yl, [1,3,4]-thiadiazolidin-3-yl, piperidin-1-yl, piperazine-1-yl, morpholin-1-yl, thiomorpholin-1-yl, 1-oxothiomorpholin-1-yl, 1,1-dioxothiomorpholin-1-yl, azepan-1-yl, 1,4-diazepan-1-yl, pyrrolin-1-yl, pyrazolin-1-yl, imidazolin-1-yl, oxazolin-3-yl, isoxazolin-2-yl, thiazolin-3-yl, isothiazolin-1-yl, 1,2-dihydropyridin-1-yl, 1,2,3,4-tetrahydropyridin-1-yl, 1,2,5,6-tetrahydropyridin-1-yl, 1,2-dihydropyridazin, 1,6-dihydropyridazin, 1,2,3,4-tetrahydropyridazin-1-yl, 1,2,5,6-tetrahydropyridazin-1-yl, 1,2-dihydropyrimidin, 1,6-dihydropyrimidin, 1,2,3,4-tetrahydropyrimidin-1-yl, 1,2,5,6-tetrahydropyrimidin-1-yl, 1,2-dihydropyrazin-1-yl, 1,2,3,4-tetrahydropyrazin-1-yl, 1,2,5,6-tetrahydropyrazin-1-yl, pyrrol-1-yl, pyrazol-1-yl, imidazol-1-yl, [1,2,3]-1H-triazol-1-yl, [1,2,3]-2H-triazol-2-yl, [1,2,4]-1H-triazol-1-yl and [1,2,4]-4H-triazol-4-yl.

The remarks made below as to preferred embodiments of the variables (substituents) of the compounds of formula I are valid on their own as well as preferably in combination with each other, as well as in combination with the stereoisomers, salts, tautomers or N-oxides thereof.

The remarks made below concerning preferred embodiments of the variables further are valid on their own as well as preferably in combination with each other concerning the compounds of formulae I, where applicable, as well as con-

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cerning the uses and methods according to the invention and the composition according to the invention.

Preferred compounds according to the invention are compounds of formula I or a stereoisomer, salt or N-oxide thereof, wherein the salt is an agriculturally suitable salt. Further preferred compounds according to the invention are compounds of formula I or an N-oxide or salt thereof, especially an agriculturally suitable salt. Particularly preferred compounds according to the invention are compounds of formula I or a salt thereof, especially an agriculturally suitable salt thereof.

According to one embodiment of the invention the variable B in the compounds of formula I is N.

According to another embodiment of the invention the variable B in the compounds of formula I is CH.

According to a preferred embodiment of the invention the variable R in the compounds of formula I is selected from the group consisting of C₁-C₆-alkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₃-C₇-cycloalkyl, C₁-C₆-haloalkyl, R^c-C(=O)-C₁-C₂-alkyl, R^dO-C(=O)-C₁-C₂-alkyl, R^eR^fN-C(=O)-C₁-C₂-alkyl and R^k-C(=O)NH-C₁-C₂-alkyl; where R^c, R^d, R^e, R^f, R^g, R^h and R^k are as defined above and which preferably have on their own or in particular in combination the following meanings:

R^c is hydrogen, C₁-C₆-alkyl, C₃-C₇-cycloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₁-C₆-haloalkyl or phenyl, in particular C₁-C₄-alkyl or C₁-C₄-haloalkyl;

R^d is C₁-C₆-alkyl or C₁-C₆-haloalkyl, in particular C₁-C₄-alkyl,

R^e, R^f are independently of each other selected from hydrogen, C₁-C₆-alkyl, C₁-C₆-haloalkyl and benzyl, and in particular from the group consisting of hydrogen and C₁-C₄-alkyl, or

R^e, R^f together with the nitrogen atom, to which they are bound form a 5-, 6- or 7-membered, saturated or unsaturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl and C₁-C₄-haloalkyl, and in particular R^e, R^f together with the nitrogen atom, to which they are bound may form a 5-, 6- or 7-membered, saturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2, 3 or 4 methyl groups;

R^g, R^h are independently of each other selected from hydrogen, C₁-C₆-alkyl, C₁-C₆-haloalkyl and benzyl and in particular from the group consisting of hydrogen or C₁-C₄-alkyl, or

R^g, R^h together with the nitrogen atom, to which they are bound form a 5-, 6 or 7-membered, saturated or unsaturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl and C₁-C₄-haloalkyl, and in particular R^g, R^h together with the nitrogen atom, to which they are bound may form a 5-, 6- or 7-membered, saturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2, 3 or 4 methyl groups; and

R^k is H, C₁-C₄-haloalkyl or phenyl, in particular C₁-C₄-alkyl.

According to a more preferred embodiment the variable R of the compounds of the formula I is selected from the group consisting of C₁-C₄-alkyl, C₃-C₇-cycloalkyl, C₁-C₄-ha-

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loalkyl, R^c-C(=O)-C₁-C₂-alkyl, R^dO-C(=O)-C₁-C₂-alkyl, R^eR^fN-C(=O)-C₁-C₂-alkyl and R^k-C(=O)NH-C₁-C₂-alkyl, where R^c, R^d, R^e, R^f and R^k are as defined above and which preferably have on their own or in particular in combination the following meanings:

R^c is C₁-C₄-alkyl or C₁-C₄-haloalkyl,

R^d is C₁-C₄-alkyl,

R^e is hydrogen or C₁-C₄-alkyl,

R^f is hydrogen or C₁-C₄-alkyl, or

R^e, R^f together with the nitrogen atom, to which they are bound may form a 5-, 6 or 7-membered, saturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2, 3 or 4 methyl groups, and

R^k is C₁-C₄-alkyl.

According to a particular preferred embodiment of the invention the variable R in the compounds of formula I is selected from C₁-C₄-alkyl, C₃-C₇-cycloalkyl, C₁-C₄-haloalkyl and C₁-C₄-alkoxy-C₁-C₄-alkyl, in particular from methyl, ethyl, isopropyl, tert-butyl, cyclopropyl, cyclopentyl, cyclohexyl, CF₃, CHF₂, CClF₂, CH₂CF₃, CF₂CF₃, CH₂Cl, CHCl₂, ethoxyethyl, ethoxymethyl, methoxyethyl and methoxymethyl.

According to another particular preferred embodiment of the invention the variable R in the compounds of formula I is selected from C₁-C₄-alkyl, C₃-C₇-cycloalkyl, C₁-C₄-haloalkyl, methoxyethyl and methoxymethyl, in particular from methyl, ethyl, isopropyl, tert-butyl, cyclopropyl, cyclopentyl, cyclohexyl, CF₃, CHF₂, CClF₂, CH₂CF₃, CF₂CF₃, CH₂Cl, CHCl₂, methoxyethyl and methoxymethyl.

According to another preferred embodiment of the invention the variable R in the compounds of formula I is phenyl or heterocyclyl, where heterocyclyl is a 5- or 6-membered monocyclic or 8-, 9- or 10-membered bicyclic saturated, partially unsaturated or aromatic heterocycle, which contains 1, 2, 3 or 4 heteroatoms as ring members, which are selected from the group consisting of O, N and S, where phenyl and heterocyclyl are unsubstituted or substituted by 1, 2, 3 or 4 groups R' which are as defined above and which are independently from one another are preferably selected from the group consisting of halogen, C₁-C₄-alkyl, C₃-C₆-cycloalkyl, C₃-C₆-halocycloalkyl, C₁-C₄-alkoxy, C₁-C₄-alkoxy-C₁-C₄-alkyl and C₁-C₆-haloalkyloxy, more preferably from halogen, C₁-C₄-alkyl, C₃-C₆-cycloalkyl, C₁-C₄-haloalkyl and C₁-C₄-alkoxy, in particular from halogen, methyl, ethyl, methoxy and trifluoromethyl, and specifically from Cl, F, Br, methyl, methoxy and trifluoromethyl.

According to a more preferred embodiment of the invention the variable R in the compounds of formula I is phenyl or heterocyclyl, where heterocyclyl is a partially unsaturated or aromatic 5- or 6-membered monocyclic or 9- or 10-membered bicyclic heterocycle containing 1, 2, 3 or 4 heteroatoms as ring members, which are selected from the group consisting of O, N and S, where the bicyclic heterocycle consists of a 5- or 6-membered heteroaromatic ring which is fused to a phenyl ring, and where phenyl and heterocyclyl are unsubstituted or substituted by 1, 2, 3 or 4 groups R' which independently from one another have the aforementioned preferred meanings.

According to particular preferred embodiments the variable R in the compounds of the formula I is phenyl or heterocyclyl selected from pyridin-2-yl, pyridin-3-yl, pyridin-4-yl, piperidin-2-yl, piperidin-3-yl, piperidin-4-yl, benzisoxazol-2-yl, 1,2,4-oxadiazol-3-yl, 1,2,4-triazol-3-yl, 1-ethylbenzimidazol-2-yl, 4-methylthiazol-2-yl, thiophen-2-yl, furan-2-yl, furan-3-yl, tetrahydrofuran-2-yl, tetrahydrofuran-3-yl, isoxazol-2-yl, isoxazol-3-yl, isoxazol-4-yl, isoxazol-5-yl,

oxazol-2-yl, oxazol-3-yl, oxazol-4-yl, oxazol-5-yl, pyrrol-2-yl, pyrrol-3-yl, imidazol-2-yl, imidazol-4-yl, imidazol-5-yl, pyrazol-3-yl, pyrazol-4-yl, pyrazol-5-yl, isothiazol-3-yl, isothiazol-4-yl, isothiazol-5-yl, thiazol-2-yl, thiazol-4-yl, thiazol-5-yl, 1,2,3-triazol-4-yl, 1,2,3-triazol-5-yl, 1,2,5-triazol-3-yl, 1,3,4-triazol-2-yl, 1,2,4-triazol-3-yl, 1,2,4-triazol-5-yl, 1,2,4-oxadiazol-3-yl, 1,2,4-oxadiazol-5-yl, 1,3,4-oxadiazol-2-yl, 1,2,3-oxadiazol-4-yl, 1,2,3-oxadiazol-5-yl, 1,2,5-oxadiazol-3-yl, 1,2,4-thiadiazol-3-yl, 1,2,4-thiadiazol-5-yl, 1,3,4-thiadiazol-2-yl, 1,2,3-thiadiazol-4-yl, 1,2,3-thiadiazol-5-yl, 1,2,5-thiadiazol-3-yl, 2H-1,2,3,4-tetrazol-5-yl, 1H-1,2,3,4-tetrazol-1-yl, 1,2,3,4-oxatriazol-5-yl, 1,2,3,5-oxatriazol-4-yl, 1,2,3,4-thiatriazol-5-yl, 1,2,3,5-thiatriazol-4-yl, pyrazin-2-yl, pyrazin-3-yl, pyrimidin-2-yl, pyrimidin-4-yl, pyrimidin-5-yl, pyridazin-3-yl and pyridazin-4-yl, where phenyl and heterocyclyl are unsubstituted or carry 1, 2, or 3 groups R' which independently from one another have the aforementioned preferred meanings.

According to a preferred embodiment of the invention the variable R in the compounds of formula I is $R^b-S(O)_n-C_1-C_3$ -alkyl, where R^b is as defined above and in particular selected from the group consisting of C_1-C_6 -alkyl, C_3-C_7 -cycloalkyl, C_1-C_6 -haloalkyl, C_2-C_6 -alkenyl, C_2-C_6 -haloalkenyl, C_2-C_6 -alkynyl, C_2-C_6 -haloalkynyl, phenyl and heterocyclyl, where heterocyclyl is a 5- or 6-membered monocyclic saturated, partially unsaturated or aromatic heterocycle, which contains 1, 2 or 3 heteroatoms as ring members, which are selected from the group consisting of O, N and S, where phenyl and heterocyclyl are unsubstituted or substituted by 1, 2 or 3 groups, which are identical or different and preferably selected from the group consisting of halogen, C_1-C_4 -alkyl, C_1-C_2 -haloalkyl and C_1-C_2 -alkoxy.

According to a more preferred embodiment of the invention the variable R in the compounds of formula I is $R^b-S(O)_n-C_1-C_3$ -alkyl, where R^b is selected from the group consisting of C_1-C_6 -alkyl, C_2-C_6 -alkenyl, C_2-C_6 -alkynyl, C_1-C_6 -haloalkyl, C_2-C_6 -haloalkenyl, C_2-C_6 -haloalkynyl, C_3-C_7 -cycloalkyl, phenyl and heterocyclyl, where heterocyclyl is a 5- or 6-membered monocyclic saturated, partially unsaturated or aromatic heterocycle, which contains 1, 2 or 3 heteroatoms as ring members, which are selected from the group consisting of O, N and S.

According to an even more preferred embodiment of the invention the variable R in the compounds of formula I is $R^b-S(O)_n-C_1-C_2$ -alkyl, where R^b is selected from C_1-C_6 -alkyl, C_1-C_6 -haloalkyl, C_2-C_6 -alkenyl, C_2-C_6 -haloalkenyl, C_2-C_6 -alkynyl, C_3-C_7 -cycloalkyl, phenyl and heterocyclyl, where heterocyclyl is a 6-membered aromatic heterocyclic radical having 1 or 2 nitrogen atoms as ring members.

According to a particularly preferred embodiment of the invention the variable R in the compounds of formula I is $R^b-S(O)_2-C_1-C_2$ -alkyl, where R^b is CH_3 , CH_2H_3 , $CH(CH_3)_2$, $CH_2CH_2CH_3$, $CH_2CH=CH_2$, $CH_2C\equiv CH$ or phenyl.

According to specifically preferred embodiments of the invention the variable R in the compounds of formula I is selected from the group consisting of methyl, ethyl, isopropyl, tertbutyl, cyclopropyl, cyclopentyl, cyclohexyl, CF_3 , CHF_2 , $CClF_2$, CH_2CF_3 , CF_2CF_3 , CH_2Cl , $CHCl_2$, methoxyethyl, methoxymethyl, and in particular from methyl and ethyl.

Preferred compounds according to the invention are compounds of formula I, wherein R^1 is selected from the group consisting of CN, halogen, nitro, C_1-C_6 -alkyl, C_2-C_6 -alkenyl, C_2-C_6 -alkynyl, C_1-C_6 -haloalkyl, C_1-C_6 -alkoxy, C_1-C_4 -alkoxy- C_1-C_4 -alkoxy- Z^1 , C_1-C_4 -alkylthio- C_1-C_4 -alkylthio- Z^1 , C_2-C_6 -alkenyloxy, C_2-C_6 -alkynyloxy, C_1-C_6 -haloalkoxy,

C_1-C_4 -haloalkoxy- C_1-C_4 -alkoxy and $R^{1b}-S(O)_k$, where k and Z^1 are as defined herein and where R^{1b} is as defined above and in particular selected from the group consisting of C_1-C_4 -alkyl and C_1-C_4 -haloalkyl. In this context Z^1 is in particular a covalent bond.

More preferably, R^1 is selected from halogen, CN, nitro, C_1-C_4 -alkyl, C_1-C_4 -alkoxy- C_1-C_4 -alkyl, C_1-C_4 -haloalkoxy- C_1-C_4 -alkyl, C_1-C_4 -alkoxy- C_1-C_4 -alkoxy- C_1-C_4 -alkyl, C_1-C_4 -alkoxy, C_1-C_4 -haloalkoxy, C_3-C_4 -alkenyloxy, C_3-C_4 -alkynyloxy, C_1-C_4 -alkoxy- C_1-C_4 -alkoxy, C_1-C_4 -haloalkoxy- C_1-C_4 -alkoxy, C_1-C_4 -alkyl- $S(O)_k$ and C_1-C_4 -haloalkyl- $S(O)_k$, where k is 0 or 2.

In particular, R^1 is selected from the group consisting of halogen, C_1-C_4 -alkyl, C_1-C_4 -alkoxy, C_1-C_4 -haloalkoxy, C_1-C_4 -haloalkylthio and C_1-C_4 -alkylsulfonyl, specifically R^1 is F, Cl, Br, CH_3 , CF_3 , OCF_3 , SCF_3 , SO_2CH_3 or $CH_2OCH_2CH_2OCH_3$, and more specifically R^1 is Cl, CH_3 , CF_3 or SO_2CH_3 .

Preferred compounds according to the invention are compounds of formula I, wherein R^3 is selected from the group consisting of hydrogen, cyano, halogen, nitro, C_1-C_4 -alkyl, C_1-C_4 -alkoxy, C_1-C_4 -haloalkoxy, C_2-C_4 -alkenyl, C_2-C_4 -alkynyl, C_2-C_4 -alkenyloxy, C_2-C_4 -alkynyloxy or $R^{2b}-S(O)_k$, where the variables k and R^{2b} have one of the herein defined meanings.

More preferably, R^3 is selected from the group consisting of hydrogen, halogen, CN, NO_2 , C_1-C_4 -haloalkyl, C_1-C_4 -alkoxy, C_1-C_4 -haloalkoxy, C_1-C_4 -alkylthio, C_1-C_4 -haloalkylthio, C_1-C_4 -alkyl- $S(O)_2$ and C_1-C_4 -haloalkyl- $S(O)_2$.

In particular, R^3 is selected from the group consisting of hydrogen, halogen, CN, NO_2 , C_1-C_2 -alkyl, C_1-C_2 -haloalkyl, C_1-C_2 -alkoxy, C_1-C_2 -haloalkoxy, C_1-C_2 -alkylthio, C_1-C_2 -haloalkylthio, C_1-C_2 -alkyl- $S(O)_2$ and C_1-C_2 -haloalkyl- $S(O)_2$, specifically from H, Cl, F, CN, NO_2 , CH_3 , CF_3 , CHF_2 , OCH_3 , OCF_3 , $OCHF_2$, SCH_3 , SCF_3 , $SCHF_2$, $S(O)_2CH_3$ and $S(O)_2CH_2CH_3$, and more specifically from Cl, F, CN, CF_3 and $S(O)_2CH_3$.

Preferred compounds according to the invention are compounds of formula I, wherein R^4 is selected from the group consisting of hydrogen, cyano, halogen, nitro, C_1-C_2 -alkyl and C_1-C_2 -haloalkyl, in particular from the group consisting of hydrogen, CHF_2 , CF_3 , CN, NO_2 , CH_3 and halogen, and specifically from hydrogen, CHF_2 , CF_3 , CN, NO_2 , CH_3 , Cl, Br and F.

Preferred compounds according to the invention are compounds of formula I, wherein R^5 is selected from the group consisting of hydrogen, halogen, C_1-C_2 -alkyl and C_1-C_2 -haloalkyl, and in particular from the group consisting of hydrogen, CHF_2 , CF_3 and halogen.

According to a particular embodiment of the invention either R^4 is hydrogen and R^5 is chlorine or fluorine, or R^5 is hydrogen and R^4 is chlorine or fluorine.

In this context, the variables R^1 , R^{11} , R^{21} , Z^1 , Z^2 , Z^{2a} , R^b , R^{1b} , R^{2b} , R^c , R^{2c} , R^d , R^{2d} , R^e , R^{2e} , R^f , R^{2f} , R^g , R^{2g} , R^h , R^{2h} , R^k , n and k, independently of each other, preferably have one of the following meanings:

R^1 , R^{11} , R^{21} independently of each other are selected from halogen, C_1-C_4 -alkyl, C_3-C_6 -cycloalkyl, C_3-C_6 -halocycloalkyl, C_1-C_4 -alkoxy, C_1-C_4 -alkoxy- C_1-C_4 -alkyl, C_1-C_4 -alkylthio- C_1-C_4 -alkyl, C_1-C_4 -alkoxy- C_1-C_4 -alkoxy and C_1-C_6 -haloalkyloxy, more preferably from halogen, C_1-C_4 -alkyl, C_3-C_6 -cycloalkyl, C_1-C_4 -haloalkyl and C_1-C_4 -alkoxy.

More preferably R^1 , R^{11} , R^{21} independently of each other are selected from the group consisting of halogen, C_1-C_4 -alkyl, C_3-C_6 -cycloalkyl, C_1-C_4 -haloalkyl, C_1-C_4 -alkoxy, C_1-C_4 -alkoxy- C_1-C_4 -alkyl, C_1-C_4 -alkylthio- C_1-C_4 -alkyl and

C₁-C₄-alkoxy-C₁-C₄-alkoxy; in particular selected from halogen, C₁-C₄-alkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkyl, C₁-C₄-alkoxy-C₁-C₄-alkyl and C₁-C₄-alkoxy-C₁-C₄-alkoxy; and specifically from Cl, F, Br, methyl, ethyl, methoxy and trifluoromethyl.

Z, Z¹, Z² independently of each other are selected from a covalent bond, methanediyl and ethanediyl, and in particular are a covalent bond.

Z^{2a} as selected from a covalent bond, C₁-C₂-alkanediyl, O—C₁-C₂-alkanediyl, C₁-C₂-alkanediyl-O and C₁-C₂-alkanediyl-O—C₁-C₂-alkanediyl; more preferably from a covalent bond, methanediyl, ethanediyl, O-methanediyl, O-ethanediyl, methanediyl-O, and ethanediyl-O; and in particular from a covalent bond, methanediyl and ethanediyl.

R^b, R^{1b}, R^{2b} independently of each other are selected from C₁-C₆-alkyl, C₃-C₇-cycloalkyl, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, phenyl and heterocyclyl, where heterocyclyl is a 5- or 6-membered monocyclic saturated, partially unsaturated or aromatic heterocycle, which contains 1, 2 or 3 heteroatoms as ring members, which are selected from the group consisting of O, N and S, where phenyl and heterocyclyl are unsubstituted or substituted by 1, 2 or 3 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₂-haloalkyl and C₁-C₂-alkoxy.

More preferably R^b, R^{1b}, R^{2b} independently of each other are selected from the group consisting of C₁-C₄-alkyl, C₂-C₄-alkenyl, C₂-C₄-alkynyl, C₁-C₄-haloalkyl, C₂-C₄-haloalkenyl, C₂-C₄-haloalkynyl, C₃-C₆-cycloalkyl, phenyl and heterocyclyl, where heterocyclyl is a 5- or 6-membered monocyclic saturated, partially unsaturated or aromatic heterocycle, which contains 1, 2 or 3 heteroatoms as ring members, which are selected from the group consisting of O, N and S.

In particular, R^b, R^{1b}, R^{2b} independently of each other are selected from C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₂-C₄-alkenyl, C₂-C₄-haloalkenyl, C₂-C₄-alkynyl, C₃-C₆-cycloalkyl, phenyl and heterocyclyl, where heterocyclyl is a 5- or 6-membered aromatic heterocyclic radical having 1 or 2 nitrogen atoms as ring members.

R^c, R^{2c}, R^k independently of each other are selected from hydrogen, C₁-C₆-alkyl, C₃-C₇-cycloalkyl, which is unsubstituted or partly or completely halogenated, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, phenyl, benzyl and heterocyclyl, where heterocyclyl is a 5- or 6-membered monocyclic saturated, partially unsaturated or aromatic heterocycle, which contains 1, 2 or 3 heteroatoms as ring members, which are selected from the group consisting of O, N and S, where phenyl, benzyl and heterocyclyl are unsubstituted or substituted by 1, 2 or 3 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl and C₁-C₄-alkoxy.

More preferably R^c, R^{2c}, R^k independently of each other are selected from hydrogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₂-C₄-alkenyl, C₂-C₄-haloalkenyl, C₂-C₄-alkynyl, C₃-C₆-cycloalkyl, phenyl and heterocyclyl, where heterocyclyl is a 5- or 6-membered monocyclic saturated, partially unsaturated or aromatic heterocycle, which contains 1, 2 or 3 heteroatoms as ring members, which are selected from the group consisting of O, N and S.

In particular, R^c, R^{2c}, R^k independently of each other are selected from hydrogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₂-C₄-alkenyl, C₂-C₄-haloalkenyl, C₃-C₆-cycloalkyl, phenyl and heterocyclyl, where heterocyclyl is a 5- or 6-membered aromatic heterocyclic radical having 1 or 2 nitrogen atoms as ring members.

R^d, R^{2d} independently of each other are selected from C₁-C₆-alkyl, C₃-C₇-cycloalkyl, which is unsubstituted or partly or completely halogenated, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, phenyl and benzyl.

More preferably R^d, R^{2d} independently of each other are selected from C₁-C₆-alkyl, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₁-C₄-alkoxy-C₁-C₄-alkyl and C₃-C₇-cycloalkyl, which is unsubstituted or partly or completely halogenated, and in particular selected from C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₂-C₄-alkenyl, C₂-C₄-haloalkenyl, C₂-C₄-alkynyl and C₃-C₆-cycloalkyl.

R^e, R^f, R^{2e}, R^{2f} independently of each other are selected from the group consisting of hydrogen, C₁-C₆-alkyl, C₃-C₇-cycloalkyl, which is unsubstituted or partially or completely halogenated, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, phenyl and benzyl, where phenyl and benzyl are unsubstituted or substituted by 1, 2 or 3 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl and C₁-C₄-alkoxy, or R^e and R^f or R^{2e} and R^{2f} together with the nitrogen atom, to which they are bound may form a 5-, 6 or 7-membered, saturated or unsaturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl and C₁-C₄-alkoxy.

More preferably R^e, R^f, R^{2e}, R^{2f} independently of each other are selected from hydrogen, C₁-C₆-alkyl, C₁-C₆-haloalkyl and benzyl, or R^e and R^f or R^{2e} and R^{2f} together with the nitrogen atom, to which they are bound may form a 5- or 6-membered, saturated or unsaturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2 or 3 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl and C₁-C₄-haloalkyl.

In particular, R^e, R^f, R^{2e}, R^{2f} independently of each other are selected from hydrogen and C₁-C₄-alkyl, or R^e and R^f or R^{2e} and R^{2f} together with the nitrogen atom, to which they are bound may form a 5- or 6-membered, saturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2 or 3 methyl groups.

R^g, R^{2g} independently of each other are selected from hydrogen, C₁-C₆-alkyl, C₃-C₇-cycloalkyl, which is unsubstituted or partly or completely halogenated, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, phenyl and benzyl.

More preferably R^g, R^{2g} independently of each other are selected from hydrogen, C₁-C₆-alkyl, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, benzyl, C₁-C₄-alkoxy-C₁-C₄-alkyl and C₃-C₇-cycloalkyl, which is unsubstituted or partly or completely halogenated, and in particular selected from hydrogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₂-C₄-alkenyl, C₂-C₄-haloalkenyl, benzyl and C₃-C₆-cycloalkyl.

R^h, R^{2h} independently of each other are selected from hydrogen, C₁-C₆-alkyl, C₃-C₇-cycloalkyl, which is unsubstituted or partly or completely halogenated, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, phenyl, benzyl and a radical C(=O)—R^k, where R^k is H, C₁-C₄-haloalkyl or phenyl.

More preferably R^h, R^{2h} independently of each other are selected from hydrogen, C₁-C₆-alkyl, C₁-C₆-haloalkyl,

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C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, benzyl, C₁-C₄-alkoxy-C₁-C₄-alkyl and C₃-C₇-cycloalkyl, which is unsubstituted or partly or completely halogenated, and in particular selected from hydrogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₂-C₄-alkenyl, C₂-C₄-haloalkenyl, benzyl and C₃-C₆-cycloalkyl; or

R^g and R^h or R^{2g} and R^{2h} together with the nitrogen atom, to which they are bound may form a 5-, 6 or 7-membered, saturated or unsaturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of =O, halogen, C₁-C₄-alkyl and C₁-C₄-haloalkyl and C₁-C₄-alkoxy;

more preferably R^g and R^h or R^{2g} and R^{2h} together with the nitrogen atom, to which they are bound may form a 5- or 6-membered, saturated or unsaturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2 or 3 groups, which are identical or different and selected from the group consisting of halogen, C₁-C₄-alkyl and C₁-C₄-haloalkyl;

and in particular, R^g and R^h or R^{2g} and R^{2h} together with the nitrogen atom, to which they are bound may form a 5- or 6-membered, saturated N-bound heterocyclic radical, which may carry as a ring member a further heteroatom selected from O, S and N and which is unsubstituted or may carry 1, 2 or 3 methyl groups.

n and k independently of each other are 0 or 2, and in particular 2.

Particularly preferred are compounds of formula I, wherein the variables R¹ and R³ have the following meanings:

R¹ is selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy, C₁-C₄-haloalkylthio and C₁-C₄-alkylsulfonyl, in particular from F, Cl, Br, CH₃, CF₃, OCH₃, SCH₃, OCF₃, SCF₃, SO₂CH₃, CH₂OCH₃ and CH₂OCH₂CH₂OCH₃; and

R³ is selected from the group consisting of hydrogen, halogen, CN, NO₂, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy, C₁-C₄-haloalkylthio and C₁-C₄-alkylsulfonyl, in particular from H, Cl, Br, CN, NO₂, CH₃, CF₃, CHF₂, OCH₃, OCF₃, OCHF₂, SCH₃, SCF₃, SCHF₂, S(O)₂CH₃ and S(O)₂CH₂CH₃.

Especially preferred are compounds of formula I, wherein the variables R, R¹, R³, R⁴ and R⁵ have the following meanings:

R is selected from C₁-C₄-alkyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, in particular from CH₃, CH₂CH₃, CH(CH₃)₂, C(CH₃)₃, methoxyethyl and methoxymethyl;

R¹ is selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl and C₁-C₄-alkyl-S(O)₂, in particular from Cl, Br, F, CH₃, CH₂CH₃, CH(CH₃)₂, CF₃, CHF₂, S(O)₂CH₃ and S(O)₂CH₂CH₃;

R³ is selected from the group consisting of halogen, CN, C₁-C₄-haloalkyl and C₁-C₄-alkyl-S(O)₂, in particular from Cl, F, CN, CF₃, CHF₂, S(O)₂CH₃ and S(O)₂CH₂CH₃;

R⁴ is selected from the group consisting of hydrogen, CN, CHF₂, CF₃, CH₃, NO₂ and halogen, in particular from hydrogen, CHF₂, CF₃, CH₃, Cl and F; and

R⁵ is selected from the group consisting of hydrogen, halogen, CHF₂ and CF₃, in particular from hydrogen, Cl, F, CHF₂ and CF₃, provided that at least one of the radicals R⁴ and R⁵ is different from hydrogen.

Specifically preferred are compounds of formula I, wherein the variables R, R¹, R³, R⁴ and R⁵ have the following meanings:

R is selected from the group consisting of methyl, ethyl, methoxyethyl and methoxymethyl;

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R¹ is selected from the group consisting of chlorine, methyl, trifluoromethyl and methylsulfonyl;

R³ is selected from the group consisting of fluorine, chlorine, trifluoromethyl, CN and methylsulfonyl;

and either R⁴ is hydrogen and R⁵ is chlorine or fluorine, or R⁵ is hydrogen and R⁴ is chlorine or fluorine.

According to a preferred embodiment of the invention the radicals R¹, R³, R⁴ and R⁵ together form one of the following substitution patterns on the pyridinyl ring of compounds of formula I, provided that position 3 is the attachment point of the phenyl ring to the remainder of the molecule:

2-Br-4,6-Cl₂, 2,4-Cl₂-6-CN, 2,4,6-Cl₃, 2,4-Cl₂-6-F, 2,4-Cl₂-6-CF₃, 2,4-Cl₂-6-S(O)₂CH₃, 2-CF₃-4-Cl-6-CN, 2-CF₃-4,6-Cl₂, 2-CF₃-4-Cl-6-CF₃, 2-CF₃-4-Cl-6-S(O)₂CH₃, 2-CF₃-4-Cl-6-F, 2-CH₃-4-Cl-6-CN, 2-CH₃-4,6-Cl₂, 2-CH₃-4-Cl-6-CF₃, 2-CH₃-4-Cl-6-S(O)₂CH₃, 2-CH₃-4-Cl-6-F, 2-S(O)₂CH₃-4-Cl-6-CN, 2-S(O)₂CH₃-4,6-Cl₂, 2-S(O)₂CH₃-4-Cl-6-CF₃, 2-S(O)₂CH₃-4-Cl-6-S(O)₂CH₃, 2-S(O)₂CH₃-4-Cl-6-F, 2-Cl-4-F-6-CN, 2-Cl-4-F-6-CF₃, 2-Cl-4-F-6-S(O)₂CH₃, 2,6-Cl₂-4-F, 2-Cl-4,6-F₂, 2-CF₃-4-F-6-CN, 2-CF₃-4-F-6-CF₃, 2-CF₃-4-F-6-S(O)₂CH₃, 2-CF₃-4-F-6-Cl, 2-CF₃-4,6-F₂, 2-CH₃-4-F-6-CN, 2-CH₃-4-F-6-CF₃, 2-CH₃-4-F-6-S(O)₂CH₃, 2-CH₃-4-F-6-Cl, 2-CH₃-4,6-F₂, 2-S(O)₂CH₃-4-F-6-CN, 2-S(O)₂CH₃-4-F-6-CF₃, 2-S(O)₂CH₃-4-F-6-S(O)₂CH₃, 2-S(O)₂CH₃-4-F-6-Cl, 2-S(O)₂CH₃-4,6-F₂, 2,5-Cl₂-6-CN, 2,5,6-Cl₃, 2,5-Cl₂-6-F, 2,5-Cl₂-6-CF₃, 2,5-Cl₂-6-S(O)₂CH₃, 2-CF₃-5-Cl-6-CN, 2-CF₃-5,6-Cl₂, 2-CF₃-5-Cl-6-CF₃, 2-CF₃-5-Cl-6-S(O)₂CH₃, 2-CF₃-5-Cl-6-F, 2-CH₃-5-Cl-6-CN, 2-CH₃-5,6-Cl₂, 2-CH₃-5-Cl-6-CF₃, 2-CH₃-5-Cl-6-S(O)₂CH₃, 2-CH₃-5-Cl-6-F, 2-S(O)₂CH₃-5-Cl-6-CN, 2-S(O)₂CH₃-5,6-Cl₂, 2-S(O)₂CH₃-5-Cl-6-CF₃, 2-S(O)₂CH₃-5-Cl-6-S(O)₂CH₃, 2-S(O)₂CH₃-5-Cl-6-F, 2-Cl-5-F-6-CN, 2-Cl-5-F-6-CF₃, 2-Cl-5-F-6-S(O)₂CH₃, 2,6-Cl₂-5-F, 2-Cl-5,6-F₂, 2-CF₃-5-F-6-CN, 2-CF₃-5-F-6-CF₃, 2-CF₃-5-F-6-S(O)₂CH₃, 2-CF₃-5-F-6-Cl, 2-CF₃-5,6-F₂, 2-CH₃-5-F-6-CN, 2-CH₃-5-F-6-CF₃, 2-CH₃-5-F-6-S(O)₂CH₃, 2-CH₃-5-F-6-Cl, 2-CH₃-5,6-F₂, 2-S(O)₂CH₃-5-F-6-CN, 2-S(O)₂CH₃-5-F-6-CF₃, 2-S(O)₂CH₃-5-F-6-S(O)₂CH₃, 2-S(O)₂CH₃-5-F-6-Cl or 2-S(O)₂CH₃-5,6-F₂.

Examples of preferred compounds are the individual compounds compiled in Tables 1 to 8 below. Moreover, the meanings mentioned below for the individual variables in the Tables are per se, independently of the combination in which they are mentioned, a particularly preferred embodiment of the substituents in question.

Table 1 Compounds of formula I (I.A-1-I.A-160) in which B is CH and R is methyl and the combination of R¹, R³, R⁴ and R⁵ for a compound corresponds in each case to one row of Table A;

Table 2 Compounds of formula I (II.A-1-II.A-160) in which B is CH and R is ethyl and the combination of R¹, R³, R⁴ and R⁵ for a compound corresponds in each case to one row of Table A;

Table 3 Compounds of formula I (III.A-1-III.A-160) in which B is CH and R is methoxyethyl and the combination of R¹, R³, R⁴ and R⁵ for a compound corresponds in each case to one row of Table A;

Table 4 Compounds of formula I (IV.A-1-IV.A-160) in which B is CH and R is methoxymethyl and the combination of R¹, R³, R⁴ and R⁵ for a compound corresponds in each case to one row of Table A;

Table 5 Compounds of formula I (V.A-1-V.A-160) in which B is N and R is methyl and the combination of R¹, R³, R⁴ and R⁵ for a compound corresponds in each case to one row of Table A;

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Table 6 Compounds of formula I (VI.A-1-VI.A-160) in which B is N and R is ethyl and the combination of R¹, R³, R⁴ and R⁵ for a compound corresponds in each case to one row of Table A;

Table 7 Compounds of formula I (VII.A-1-VII.A-160) in which B is N and R is methoxyethyl and the combination of R¹, R³, R⁴ and R⁵ for a compound corresponds in each case to one row of Table A;

Table 8 Compounds of formula I (VIII.A-1-VIII.A-160) in which B is N and R is methoxymethyl and the combination of R¹, R³, R⁴ and R⁵ for a compound corresponds in each case to one row of Table A;

TABLE A

	R ¹	R ³	R ⁴	R ⁵
A-1	Cl	Cl	H	F
A-2	Cl	Cl	H	Cl
A-3	Cl	Cl	F	F
A-4	Cl	Cl	F	Cl
A-5	Cl	Cl	F	H
A-6	Cl	Cl	Cl	F
A-7	Cl	Cl	Cl	Cl
A-8	Cl	Cl	Cl	H
A-9	Cl	F	H	F
A-10	Cl	F	H	Cl
A-11	Cl	F	F	F
A-12	Cl	F	F	Cl
A-13	Cl	F	F	H
A-14	Cl	F	Cl	F
A-15	Cl	F	Cl	Cl
A-16	Cl	F	Cl	H
A-17	Cl	CF ₃	H	F
A-18	Cl	CF ₃	H	Cl
A-19	Cl	CF ₃	F	F
A-20	Cl	CF ₃	F	Cl
A-21	Cl	CF ₃	F	H
A-22	Cl	CF ₃	Cl	F
A-23	Cl	CF ₃	Cl	Cl
A-24	Cl	CF ₃	Cl	H
A-25	Cl	SO ₂ CH ₃	H	F
A-26	Cl	SO ₂ CH ₃	H	Cl
A-27	Cl	SO ₂ CH ₃	F	F
A-28	Cl	SO ₂ CH ₃	F	Cl
A-29	Cl	SO ₂ CH ₃	F	H
A-30	Cl	SO ₂ CH ₃	Cl	F
A-31	Cl	SO ₂ CH ₃	Cl	Cl
A-32	Cl	SO ₂ CH ₃	Cl	H
A-33	Cl	CN	H	F
A-34	Cl	CN	H	Cl
A-35	Cl	CN	F	F
A-36	Cl	CN	F	Cl
A-37	Cl	CN	F	H
A-38	Cl	CN	Cl	F
A-39	Cl	CN	Cl	Cl
A-40	Cl	CN	Cl	H
A-41	CH ₃	Cl	H	F
A-42	CH ₃	Cl	H	Cl
A-43	CH ₃	Cl	F	F
A-44	CH ₃	Cl	F	Cl
A-45	CH ₃	Cl	F	H
A-46	CH ₃	Cl	Cl	F
A-47	CH ₃	Cl	Cl	Cl
A-48	CH ₃	Cl	Cl	H
A-49	CH ₃	F	H	F
A-50	CH ₃	F	H	Cl
A-51	CH ₃	F	F	F
A-52	CH ₃	F	F	Cl
A-53	CH ₃	F	F	H
A-54	CH ₃	F	Cl	F
A-55	CH ₃	F	Cl	Cl
A-56	CH ₃	F	Cl	H
A-57	CH ₃	CF ₃	H	F
A-58	CH ₃	CF ₃	H	Cl
A-59	CH ₃	CF ₃	F	F
A-60	CH ₃	CF ₃	F	Cl
A-61	CH ₃	CF ₃	F	H
A-62	CH ₃	CF ₃	Cl	F

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TABLE A-continued

	R ¹	R ³	R ⁴	R ⁵
A-63	CH ₃	CF ₃	Cl	Cl
A-64	CH ₃	CF ₃	Cl	H
A-65	CH ₃	SO ₂ CH ₃	H	F
A-66	CH ₃	SO ₂ CH ₃	H	Cl
A-67	CH ₃	SO ₂ CH ₃	F	F
A-68	CH ₃	SO ₂ CH ₃	F	Cl
A-69	CH ₃	SO ₂ CH ₃	F	H
A-70	CH ₃	SO ₂ CH ₃	Cl	F
A-71	CH ₃	SO ₂ CH ₃	Cl	Cl
A-72	CH ₃	SO ₂ CH ₃	Cl	H
A-73	CH ₃	CN	H	F
A-74	CH ₃	CN	H	Cl
A-75	CH ₃	CN	F	F
A-76	CH ₃	CN	F	Cl
A-77	CH ₃	CN	F	H
A-78	CH ₃	CN	Cl	F
A-79	CH ₃	CN	Cl	Cl
A-80	CH ₃	CN	Cl	H
A-81	CF ₃	Cl	H	F
A-82	CF ₃	Cl	H	Cl
A-83	CF ₃	Cl	F	F
A-84	CF ₃	Cl	F	Cl
A-85	CF ₃	Cl	F	H
A-86	CF ₃	Cl	Cl	F
A-87	CF ₃	Cl	Cl	Cl
A-88	CF ₃	Cl	Cl	H
A-89	CF ₃	F	H	F
A-90	CF ₃	F	H	Cl
A-91	CF ₃	F	F	F
A-92	CF ₃	F	F	Cl
A-93	CF ₃	F	F	H
A-94	CF ₃	F	Cl	F
A-95	CF ₃	F	Cl	Cl
A-96	CF ₃	F	Cl	H
A-97	CF ₃	CF ₃	H	F
A-98	CF ₃	CF ₃	H	Cl
A-99	CF ₃	CF ₃	F	F
A-100	CF ₃	CF ₃	F	Cl
A-101	CF ₃	CF ₃	F	H
A-102	CF ₃	CF ₃	Cl	F
A-103	CF ₃	CF ₃	Cl	Cl
A-104	CF ₃	CF ₃	Cl	H
A-105	CF ₃	SO ₂ CH ₃	H	F
A-106	CF ₃	SO ₂ CH ₃	H	Cl
A-107	CF ₃	SO ₂ CH ₃	F	F
A-108	CF ₃	SO ₂ CH ₃	F	Cl
A-109	CF ₃	SO ₂ CH ₃	F	H
A-110	CF ₃	SO ₂ CH ₃	Cl	F
A-111	CF ₃	SO ₂ CH ₃	Cl	Cl
A-112	CF ₃	SO ₂ CH ₃	Cl	H
A-113	CF ₃	CN	H	F
A-114	CF ₃	CN	H	Cl
A-115	CF ₃	CN	F	F
A-116	CF ₃	CN	F	Cl
A-117	CF ₃	CN	F	H
A-118	CF ₃	CN	Cl	F
A-119	CF ₃	CN	Cl	Cl
A-120	CF ₃	CN	Cl	H
A-121	SO ₂ CH ₃	Cl	H	F
A-122	SO ₂ CH ₃	Cl	H	Cl
A-123	SO ₂ CH ₃	Cl	F	F
A-124	SO ₂ CH ₃	Cl	F	Cl
A-125	SO ₂ CH ₃	Cl	F	H
A-126	SO ₂ CH ₃	Cl	Cl	F
A-127	SO ₂ CH ₃	Cl	Cl	Cl
A-128	SO ₂ CH ₃	Cl	Cl	H
A-129	SO ₂ CH ₃	F	H	F
A-130	SO ₂ CH ₃	F	H	Cl
A-131	SO ₂ CH ₃	F	F	F
A-132	SO ₂ CH ₃	F	F	Cl
A-133	SO ₂ CH ₃	F	F	H
A-134	SO ₂ CH ₃	F	Cl	F
A-135	SO ₂ CH ₃	F	Cl	Cl
A-136	SO ₂ CH ₃	F	Cl	H
A-137	SO ₂ CH ₃	CF ₃	H	F
A-138	SO ₂ CH ₃	CF ₃	H	Cl
A-139	SO ₂ CH ₃	CF ₃	F	F
A-140	SO ₂ CH ₃	CF ₃	F	Cl

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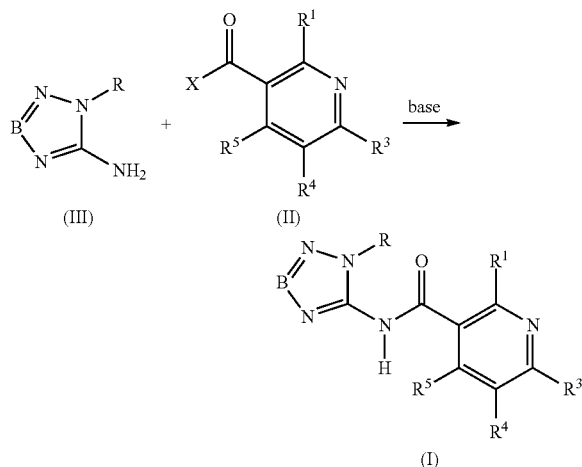
TABLE A-continued

	R ¹	R ³	R ⁴	R ⁵
A-141	SO ₂ CH ₃	CF ₃	F	H
A-142	SO ₂ CH ₃	CF ₃	Cl	F
A-143	SO ₂ CH ₃	CF ₃	Cl	Cl
A-144	SO ₂ CH ₃	CF ₃	Cl	H
A-145	SO ₂ CH ₃	SO ₂ CH ₃	H	F
A-146	SO ₂ CH ₃	SO ₂ CH ₃	H	Cl
A-147	SO ₂ CH ₃	SO ₂ CH ₃	F	F
A-148	SO ₂ CH ₃	SO ₂ CH ₃	F	Cl
A-149	SO ₂ CH ₃	SO ₂ CH ₃	F	H
A-150	SO ₂ CH ₃	SO ₂ CH ₃	Cl	F
A-151	SO ₂ CH ₃	SO ₂ CH ₃	Cl	Cl
A-152	SO ₂ CH ₃	SO ₂ CH ₃	Cl	H
A-153	SO ₂ CH ₃	CN	H	F
A-154	SO ₂ CH ₃	CN	H	Cl
A-155	SO ₂ CH ₃	CN	F	F
A-156	SO ₂ CH ₃	CN	F	Cl
A-157	SO ₂ CH ₃	CN	F	H
A-158	SO ₂ CH ₃	CN	Cl	F
A-159	SO ₂ CH ₃	CN	Cl	Cl
A-160	SO ₂ CH ₃	CN	Cl	H

The compounds of formula I can be prepared by standard methods of organic chemistry, e.g. by the methods described hereinafter in schemes 1 to 8. The substituents, variables and indices in schemes 1 to 8 are as defined above for formula I, if not otherwise specified.

The compounds of formula I can be prepared analogous to Scheme 1 below.

Scheme 1:



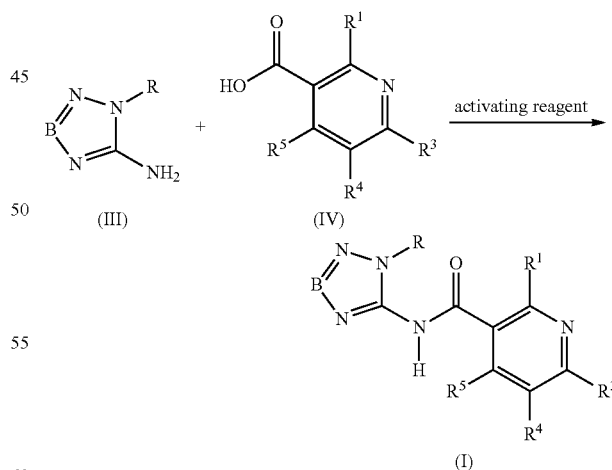
5-Amino-1-R-1,2,4-triazole or 5-amino-1-R-tetrazole compounds of formula III can be reacted with benzoyl derivatives of formula II to afford compounds of formula I. X is a leaving group, such as halogen, in particular Cl, an anhydride residue or an active ester residue. Especially in case of X being halogen the reaction is suitably carried out in the presence of a base. Suitable bases are for example carbonates, such as lithium, sodium or potassium carbonates, amines, such as trimethylamine or triethylamine, and basic N-heterocycles, such as pyridine, 2,6-dimethylpyridine or 2,4,6-trimethylpyridine. Suitable solvents are in particular aprotic solvents such as pentane, hexane, heptane, octane, cyclohexane, dichloromethane, chloroform, 1,2-dichloroethane, benzene, chlorobenzene, toluene, the xylenes, dichlorobenzene, trimethylbenzene, pyridine, 2,6-dimethylpyridine, 2,4,6-trimethylpyridine, acetonitrile, diethyl ether, tetrahydrofuran, 2-me-

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thyl tetrahydrofuran, methyl tert-butylether, 1,4-dioxane, N,N-dimethyl formamide, N-methylpyrrolidinone or mixtures thereof. The starting materials are generally reacted with one another in equimolar or nearly equimolar amounts at a reaction temperature usually in the range of -20°C . to 100°C . and preferably in the range of -5°C . to 50°C .

Alternatively, compounds of formula I can also be prepared as shown in Scheme 2. Reaction of 5-amino-1-R-1,2,4-triazole or 5-amino-1-R-tetrazole of formula III with a benzoic acid derivative of formula IV yields compound I. The reaction is preferably carried out in the presence of a suitable activating agent, which converts the acid group of compound IV into an activated ester or amide. For this purpose activating agents known in the art, such as 1,1'-carbonyldiimidazole (CDI), dicyclohexyl carbodiimide (DCC), 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide (EDC) or 2,4,6-tripropyl-1,3,5,2,4,6-trioxatriphosphorinane-2,4,6-trioxide (T3P) can be employed. The activated ester or amide can be formed, depending in particular on the specific activating agent used, either in situ by contacting compound IV with the activating agent in the presence of compound III, or in a separate step prior to the reaction with compound III. It may be advantageous, especially in cases where DCC or EDC are used as activating agent, to include further additives in the activating reaction, such as hydroxybenzotriazole (HOBt), nitrophenol, pentafluorophenol, 2,4,5-trichlorophenol or N-hydroxysuccinimide. It may further be advantageous to prepare the activated ester or amide in the presence of a base, for example a tertiary amine. The activated ester or amide is either in situ or subsequently reacted with the amine of formula III to afford the amide of formula I. The reaction normally takes place in anhydrous inert solvents, such as chlorinated hydrocarbons, e.g. dichloromethane or dichloroethane, ethers, e.g. tetrahydrofuran or 1,4-dioxane or carboxamides, e.g. N,N-dimethylformamide, N,N-dimethylacetamide or N-methylpyrrolidone. The reaction is ordinarily carried out at temperatures in the range from -20°C . to $+25^{\circ}\text{C}$.

Scheme 2:

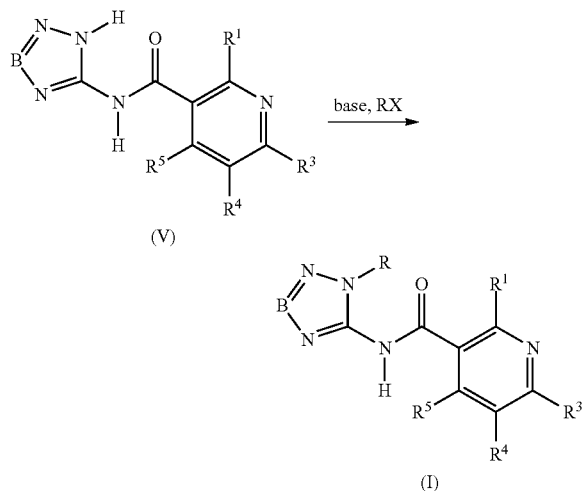


The compounds of formula II and their respective benzoic acid precursors of formula IV can be purchased or can be prepared by processes known in the art or disclosed in the literature, e.g. in WO 9746530, WO 9831676, WO 9831681, WO 2002/018352, WO 2000/003988, US 2007/0191335, U.S. Pat. No. 6,277,847.

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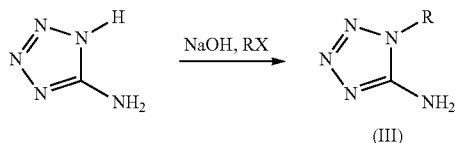
Furthermore, compounds of formula I, can be obtained by treating N-(1H-1,2,4-triazol-5-yl)benzamides or N-(1H-tetrazol-5-yl)benzamides of formula V with, for example, alkylating agents such as alkyl halides according to Scheme 3.

Scheme 3.



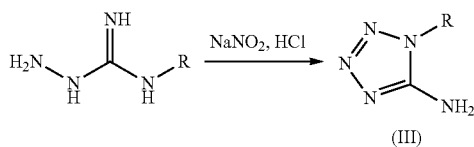
The 5-amino-1-R-tetrazoles of formula III, where R is for example alkyl, are either commercially available or are obtainable according to methods known from the literature. For example, 5-amino-1-R-tetrazole can be prepared from 5-aminotetrazole according to the method described in the Journal of the American Chemical Society, 1954, 76, 923-924 (Scheme 4).

Scheme 4.



Alternatively, 5-amino-1-R-tetrazole compounds of formula III can be prepared according to the method described in the Journal of the American Chemical Society, 1954, 76, 88-89 (Scheme 5).

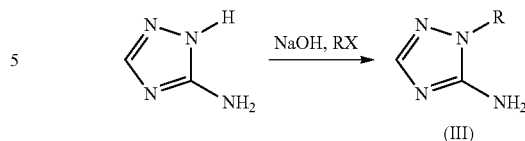
Scheme 5:



As shown in Scheme 6, 5-amino-1-R-triazoles of formula III, where R is for example alkyl, are either commercially available or are obtainable according to methods described in the literature. For example, 5-amino-1-R-triazole can be prepared from 5-aminotriazole according to the method described in Zeitschrift für Chemie, 1990, 30, 12, 436-437.

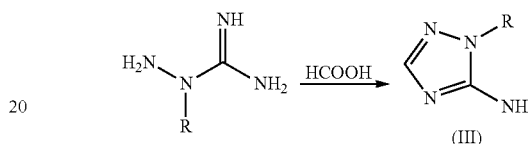
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Scheme 6:



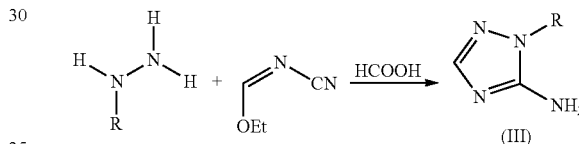
5-Amino-1-R-triazole compounds of formula III, can also be prepared analogous to the synthesis described in Chemische Berichte, 1964, 97, 2, 396-404, as shown in Scheme 7.

Scheme 7:



Alternatively, 5-amino-1-R-triazoles of formula III, can be prepared according to the synthesis described in Angewandte Chemie, 1963, 75, 918 (Scheme 8).

Scheme 8.



As a rule, the compounds of formula I including their stereoisomers, salts, tautomers and N-oxides, and their precursors in the synthesis process, can be prepared by the methods described above. If individual compounds can not be prepared via the above-described routes, they can be prepared by derivatization of other compounds of formula I or the respective precursor or by customary modifications of the synthesis routes described. For example, in individual cases, certain compounds of formula I can advantageously be prepared from other compounds of formula I by derivatization, e.g. by ester hydrolysis, amidation, esterification, ether cleavage, olefination, reduction, oxidation and the like, or by customary modifications of the synthesis routes described.

The reaction mixtures are worked up in the customary manner, for example by mixing with water, separating the phases, and, if appropriate, purifying the crude products by chromatography, for example on alumina or on silica gel. Some of the intermediates and end products may be obtained in the form of colorless or pale brown viscous oils which are freed or purified from volatile components under reduced pressure and at moderately elevated temperature. If the intermediates and end products are obtained as solids, they may be purified by recrystallization or trituration.

The compounds of formula I and their agriculturally suitable salts are useful as herbicides. They are useful as such or as an appropriately formulated composition. The herbicidal compositions comprising the compound I, in particular the preferred aspects thereof, control vegetation on non-crop areas very efficiently, especially at high rates of application. They act against broad-leaved weeds and weed grasses in crops such as wheat, rice, corn, soybeans and cotton without

causing any significant damage to the crop plants. This effect is mainly observed at low rates of application.

Depending on the application method in question, the compounds of formula I, in particular the preferred aspects thereof, or compositions comprising them can additionally be employed in a further number of crop plants for eliminating unwanted plants. Examples of suitable crops are the following:

Allium cepa, *Ananas comosus*, *Arachis hypogaea*, *Asparagus officinalis*, *Avena sativa*, *Beta vulgaris* spec. *altissima*, *Beta vulgaris* spec. *rapa*, *Brassica napus* var. *napus*, *Brassica napus* var. *napobrassica*, *Brassica rapa* var. *silvestris*, *Brassica oleracea*, *Brassica nigra*, *Camellia sinensis*, *Carthamus tinctorius*, *Carya illinoensis*, *Citrus limon*, *Citrus sinensis*, *Coffea arabica* (*Coffea canephora*, *Coffea liberica*), *Cucumis sativus*, *Cynodon dactylon*, *Daucus carota*, *Elaeis guineensis*, *Fragaria vesca*, *Glycine max*, *Gossypium hirsutum*, (*Gossypium arboreum*, *Gossypium herbaceum*, *Gossypium vitifolium*), *Helianthus annuus*, *Hevea brasiliensis*, *Hordeum vulgare*, *Humulus lupulus*, *Ipomoea batatas*, *Juglans regia*, *Lens culinaris*, *Linum usitatissimum*, *Lycopersicon lycopersicum*, *Malus* spec., *Manihot esculenta*, *Medicago sativa*, *Musa* spec., *Nicotiana tabacum* (*N. rustica*), *Olea europaea*, *Oryza sativa*, *Phaseolus lunatus*, *Phaseolus vulgaris*, *Picea abies*, *Pinus* spec., *Pistacia vera*, *Pisum sativum*, *Prunus avium*, *Prunus persica*, *Pyrus communis*, *Prunus armeniaca*, *Prunus cerasus*, *Prunus dulcis* and *Prunus domestica*, *Ribes sylvestre*, *Ricinus communis*, *Saccharum officinarum*, *Secale cereale*, *Sinapis alba*, *Solanum tuberosum*, *Sorghum bicolor* (*s. vulgare*), *Theobroma cacao*, *Trifolium pratense*, *Triticum aestivum*, *Triticale*, *Triticum durum*, *Vicia faba*, *Vitis vinifera*, *Zea mays*.

The term "crop plants" also includes plants which have been modified by breeding, mutagenesis or genetic engineering. Genetically modified plants are plants whose genetic material has been modified in a manner which does not occur under natural conditions by crossing, mutations or natural recombination (i.e. reassembly of the genetic information). Here, in general, one or more genes are integrated into the genetic material of the plant to improve the properties of the plant.

Accordingly, the term "crop plants" also includes plants which, by breeding and genetic engineering, have acquired tolerance to certain classes of herbicides, such as hydroxyphenylpyruvate dioxygenase (HPPD) inhibitors, acetolactate synthase (ALS) inhibitors, such as, for example, sulfonylureas (EP-A-0257993, U.S. Pat. No. 5,013,659) or imidazolinones (see, for example, U.S. Pat. No. 6,222,100, WO 01/82685, WO 00/26390, WO 97/41218, WO 98/02526, WO 98/02527, WO 04/106529, WO 05/20673, WO 03/14357, WO 03/13225, WO 03/14356, WO 04/16073), enolpyruvylshikimate 3-phosphate synthase (EPSPS) inhibitors, such as, for example, glyphosate (see, for example, WO 92/00377), glutamine synthetase (GS) inhibitors, such as, for example, glufosinate (see, for example, EP-A-0242236, EP-A-242246), or oxynil herbicides (see, for example, U.S. Pat. No. 5,559,024).

Numerous crop plants, for example Clearfield® oilseed rape, tolerant to imidazolinones, for example imazamox, have been generated with the aid of classic breeding methods (mutagenesis). Crop plants such as soybeans, cotton, corn, beet and oilseed rape, resistant to glyphosate or glufosinate, which are available under the tradenames RoundupReady® (glyphosate) and Liberty Link® (glufosinate) have been generated with the aid of genetic engineering methods.

Accordingly, the term "crop plants" also includes plants which, with the aid of genetic engineering, produce one or

more toxins, for example those of the bacterial strain *Bacillus* ssp. Toxins which are produced by such genetically modified plants include, for example, insecticidal proteins of *Bacillus* spp., in particular *B. thuringiensis*, such as the endotoxins Cry1Ab, Cry1Ac, Cry1F, Cry1Fa2, Cry2Ab, Cry3A, Cry3Bb1, Cry9c, Cry34Ab1 or Cry35Ab1; or vegetative insecticidal proteins (VIPs), for example VIP1, VIP2, VIP3, or VIP3A; insecticidal proteins of nematode-colonizing bacteria, for example *Photorhabdus* spp. or *Xenorhabdus* spp.; toxins of animal organisms, for example wasp, spider or scorpion toxins; fungal toxins, for example from Streptomyces; plant lectins, for example from peas or barley; agglutinins; proteinase inhibitors, for example trypsin inhibitors, serine protease inhibitors, patatin, cystatin or papain inhibitors, ribosome-inactivating proteins (RIPs), for example ricin, corn-RIP, abrin, luffin, saporin or bryodin; steroid-metabolizing enzymes, for example 3-hydroxysteroid oxidase, ecdysteroid-IDP glycosyl transferase, cholesterol oxidase, ecdysone inhibitors, or HMG-CoA reductase; ion channel blockers, for example inhibitors of sodium channels or calcium channels; juvenile hormone esterase; receptors of the diuretic hormone (helicokin receptors); stilbene synthase, bibenzyl synthase, chitinases and glucanases. In the plants, these toxins may also be produced as pretoxins, hybrid proteins or truncated or otherwise modified proteins. Hybrid proteins are characterized by a novel combination of different protein domains (see, for example, WO 2002/015701). Further examples of such toxins or genetically modified plants which produce these toxins are disclosed in EP-A 374 753, WO 93/007278, WO 95/34656, EP-A 427 529, EPA 451 878, WO 03/018810 and WO 03/052073. The methods for producing these genetically modified plants are known to the person skilled in the art and disclosed, for example, in the publications mentioned above. Numerous of the toxins mentioned above bestow, upon the plants by which they are produced, tolerance to pests from all taxonomic classes of arthropods, in particular to beetles (Coleoptera), dipterans (Diptera) and butterflies (Lepidoptera) and to nematodes (Nematoda).

Genetically modified plants which produce one or more genes coding for insecticidal toxins are described, for example, in the publications mentioned above, and some of them are commercially available, such as, for example, Yield-Gard® (corn varieties producing the toxin Cry1Ab), Yield-Gard® Plus (corn varieties which produce the toxins Cry1Ab and Cry3Bb1), Starlink® (corn varieties which produce the toxin Cry9c), Herculex® RW (corn varieties which produce the toxins Cry34Ab1, Cry35Ab1 and the enzyme phosphinothricin-N-acetyltransferase [PAT]); NuCOTN® 33B (cotton varieties which produce the toxin Cry1Ac), Bollgard® I (cotton varieties which produce the toxin Cry1Ac), Bollgard® II (cotton varieties which produce the toxins Cry1Ac and Cry2Ab2); VIPCOT® (cotton varieties which produce a VIP toxin); NewLeaf® (potato varieties which produce the toxin Cry3A); Bt-Xtra®, NatureGard®, KnockOut®, BiteGard®, Protecta®, Bt11 (for example Agrisure® CB) and Bt176 from Syngenta Seeds SAS, France (corn varieties which produce the toxin Cry1Ab and the PAT enzyme), MIR604 from Syngenta Seeds SAS, France (corn varieties which produce a modified version of the toxin Cry3A, see WO 03/018810), MON 863 from Monsanto Europe S.A., Belgium (corn varieties which produce the toxin Cry3Bb1), IPC 531 from Monsanto Europe S.A., Belgium (cotton varieties which produce a modified version of the toxin Cry1Ac) and 1507 from Pioneer Overseas Corporation, Belgium (corn varieties which produce the toxin Cry1F and the PAT enzyme).

Accordingly, the term "crop plants" also includes plants which, with the aid of genetic engineering, produce one or

more proteins which are more robust or have increased resistance to bacterial, viral or fungal pathogens, such as, for example, pathogenesis-related proteins (PR proteins, see EP-A 0 392 225), resistance proteins (for example potato varieties producing two resistance genes against *Phytophthora infestans* from the wild Mexican potato *Solanum bulbocastanum*) or T4 lysozyme (for example potato cultivars which, by producing this protein, are resistant to bacteria such as *Erwinia amylovora*).

Accordingly, the term "crop plants" also includes plants whose productivity has been improved with the aid of genetic engineering methods, for example by enhancing the potential yield (for example biomass, grain yield, starch, oil or protein content), tolerance to drought, salt or other limiting environmental factors or resistance to pests and fungal, bacterial and viral pathogens.

The term "crop plants" also includes plants whose ingredients have been modified with the aid of genetic engineering methods in particular for improving human or animal diet, for example by oil plants producing health-promoting long-chain omega 3 fatty acids or monounsaturated omega 9 fatty acids (for example Nexera® oilseed rape).

The term "crop plants" also includes plants which have been modified with the aid of genetic engineering methods for improving the production of raw materials, for example by increasing the amylopectin content of potatoes (Amflora® potato).

Furthermore, it has been found that the compounds of formula I are also suitable for the defoliation and/or desiccation of plant parts, for which crop plants such as cotton, potato, oilseed rape, sunflower, soybean or field beans, in particular cotton, are suitable. In this regard, there have been found compositions for the desiccation and/or defoliation of plants, processes for preparing these compositions and methods for desiccating and/or defoliating plants using the compounds of formula I.

As desiccants, the compounds of formula I are particularly suitable for desiccating the above-ground parts of crop plants such as potato, oilseed rape, sunflower and soybean, but also cereals. This makes possible the fully mechanical harvesting of these important crop plants.

Also of economic interest is to facilitate harvesting, which is made possible by concentrating within a certain period of time the dehiscence, or reduction of adhesion to the tree, in citrus fruit, olives and other species and varieties of pomaceous fruit, stone fruit and nuts. The same mechanism, i.e. the promotion of the development of abscission tissue between fruit part or leaf part and shoot part of the plants is also essential for the readily controllable defoliation of useful plants, in particular cotton.

Moreover, a shortening of the time interval in which the individual cotton plants mature leads to an increased fiber quality after harvesting.

The compounds of formula I, or the herbicidal compositions comprising the compounds of formula I, can be used, for example, in the form of ready-to-spray aqueous solutions, powders, suspensions, also highly concentrated aqueous, oily or other suspensions or dispersions, emulsions, oil dispersions, pastes, dusts, materials for broadcasting, or granules, by means of spraying, atomizing, dusting, spreading, watering or treatment of the seed or mixing with the seed. The use forms depend on the intended purpose; in each case, they should ensure the finest possible distribution of the active ingredients according to the invention.

The herbicidal compositions comprise a herbicidally effective amount of at least one compound of the formula I or an

agriculturally useful salt of I, and auxiliaries which are customary for the formulation of crop protection agents.

Examples of auxiliaries customary for the formulation of crop protection agents are inert auxiliaries, solid carriers, surfactants (such as dispersants, protective colloids, emulsifiers, wetting agents and tackifiers), organic and inorganic thickeners, bactericides, antifreeze agents, antifoams, if appropriate colorants and, for seed formulations, adhesives.

Examples of thickeners (i.e. compounds which impart to the formulation modified flow properties, i.e. high viscosity in the state of rest and low viscosity in motion) are polysaccharides, such as xanthan gum (Kelzan® from Kelco), Rhodopol® 23 (Rhône Poulenc) or Veegum® (from R.T. Vanderbilt), and also organic and inorganic sheet minerals, such as Attaclay® (from Engelhardt).

Examples of antifoams are silicone emulsions (such as, for example, Silikon® SRE, Wacker or Rhodorsil® from Rhodia), long-chain alcohols, fatty acids, salts of fatty acids, organofluorine compounds and mixtures thereof.

Bactericides can be added for stabilizing the aqueous herbicidal formulation. Examples of bactericides are bactericides based on dichlorophen and benzyl alcohol hemiformal (Proxel® from ICI or Acticide® RS from Thor Chemie and Kathon® MK from Rohm & Haas), and also isothiazolinone derivatives, such as alkylisothiazolinones and benzisothiazolinones (Acticide MBS from Thor Chemie).

Examples of antifreeze agents are ethylene glycol, propylene glycol, urea or glycerol.

Examples of colorants are both sparingly water-soluble pigments and water-soluble dyes. Examples which may be mentioned are the dyes known under the names Rhodamin B, C.I. Pigment Red 112 and C.I. Solvent Red 1, and also pigment blue 15:4, pigment blue 15:3, pigment blue 15:2, pigment blue 15:1, pigment blue 80, pigment yellow 1, pigment yellow 13, pigment red 112, pigment red 48:2, pigment red 48:1, pigment red 57:1, pigment red 53:1, pigment orange 43, pigment orange 34, pigment orange 5, pigment green 36, pigment green 7, pigment white 6, pigment brown 25, basic violet 10, basic violet 49, acid red 51, acid red 52, acid red 14, acid blue 9, acid yellow 23, basic red 10, basic red 108.

Examples of adhesives are polyvinylpyrrolidone, polyvinyl acetate, polyvinyl alcohol and tylose.

Suitable inert auxiliaries are, for example, the following:

mineral oil fractions of medium to high boiling point, such as kerosene and diesel oil, furthermore coal tar oils and oils of vegetable or animal origin, aliphatic, cyclic and aromatic hydrocarbons, for example paraffin, tetrahydronaphthalene, alkylated naphthalenes and their derivatives, alkylated benzenes and their derivatives, alcohols such as methanol, ethanol, propanol, butanol and cyclohexanol, ketones such as cyclohexanone or strongly polar solvents, for example amines such as N-methylpyrrolidone, and water.

Solid carriers are mineral earths such as silicas, silica gels, silicates, talc, kaolin, limestone, lime, chalk, bole, loess, clay, dolomite, diatomaceous earth, calcium sulfate, magnesium sulfate and magnesium oxide, ground synthetic materials, fertilizers such as ammonium sulfate, ammonium phosphate, ammonium nitrate and ureas, and products of vegetable origin, such as cereal meal, tree bark meal, wood meal and nutshell meal, cellulose powders, or other solid carriers.

Suitable surfactants (adjuvants, wetting agents, tackifiers, dispersants and also emulsifiers) are the alkali metal salts, alkaline earth metal salts and ammonium salts of aromatic sulfonic acids, for example lignosulfonic acids (e.g. Borrespers-types, Borregaard), phenolsulfonic acids, naphthalenesulfonic acids (Morwet types, Akzo Nobel) and dibutyl naphthalenesulfonic acid (Nekal types, BASF SE), and of fatty

acids, alkyl- and alkylarylsulfonates, alkyl sulfates, lauryl ether sulfates and fatty alcohol sulfates, and salts of sulfated hexa-, hepta- and octadecanols, and also of fatty alcohol glycol ethers, condensates of sulfonated naphthalene and its derivatives with formaldehyde, condensates of naphthalene or of the naphthalenesulfonic acids with phenol and formaldehyde, polyoxyethylene octylphenol ether, ethoxylated isooctyl-, octyl- or nonylphenol, alkylphenyl or tributylphenyl polyglycol ether, alkylaryl polyether alcohols, isotridecyl alcohol, fatty alcohol/ethylene oxide condensates, ethoxylated castor oil, polyoxyethylene alkyl ethers or polyoxypropylene alkyl ethers, lauryl alcohol polyglycol ether acetate, sorbitol esters, liginosulfite waste liquors and proteins, denatured proteins, polysaccharides (e.g. methylcellulose), hydrophobically modified starches, polyvinyl alcohol (Mowiol types Clariant), polycarboxylates (BASF SE, Sokalan types), polyalkoxylates, polyvinylamine (BASF SE, Lupamine types), polyethyleneimine (BASF SE, Lupasol types), polyvinylpyrrolidone and copolymers thereof.

Powders, materials for broadcasting and dusts can be prepared by mixing or grinding the active ingredients together with a solid carrier.

Granules, for example coated granules, impregnated granules and homogeneous granules, can be prepared by binding the active ingredients to solid carriers.

Aqueous use forms can be prepared from emulsion concentrates, suspensions, pastes, wettable powders or water-dispersible granules by adding water. To prepare emulsions, pastes or oil dispersions, the compounds of formula I or Ia, either as such or dissolved in an oil or solvent, can be homogenized in water by means of a wetting agent, tackifier, dispersant or emulsifier. Alternatively, it is also possible to prepare concentrates comprising active substance, wetting agent, tackifier, dispersant or emulsifier and, if desired, solvent or oil, which are suitable for dilution with water.

The concentrations of the compounds of formula I in the ready-to-use preparations can be varied within wide ranges. In general, the formulations comprise from 0.001 to 98% by weight, preferably 0.01 to 95% by weight of at least one active compound. The active compounds are employed in a purity of from 90% to 100%, preferably 95% to 100% (according to NMR spectrum).

The formulations or ready-to-use preparations may also comprise acids, bases or buffer systems, suitable examples being phosphoric acid or sulfuric acid, or urea or ammonia.

The compounds of formula I of the invention can for example be formulated as follows:

1. Products for Dilution with Water

A Water-Soluble Concentrates

10 parts by weight of active compound are dissolved in 90 parts by weight of water or a water-soluble solvent. As an alternative, wetters or other adjuvants are added. The active compound dissolves upon dilution with water. This gives a formulation with an active compound content of 10% by weight.

B Dispersible Concentrates

20 parts by weight of active compound are dissolved in 70 parts by weight of cyclohexanone with addition of 10 parts by weight of a dispersant, for example polyvinylpyrrolidone. Dilution with water gives a dispersion. The active compound content is 20% by weight.

C Emulsifiable Concentrates

15 parts by weight of active compound are dissolved in 75 parts by weight of an organic solvent (e.g. alkylaromatics) with addition of calcium dodecylbenzenesulfonate and castor oil ethoxylate (in each case 5 parts by weight). Dilution with

water gives an emulsion. The formulation has an active compound content of 15% by weight.

D Emulsions

25 parts by weight of active compound are dissolved in 35 parts by weight of an organic solvent (e.g. alkylaromatics) with addition of calcium dodecylbenzenesulfonate and castor oil ethoxylate (in each case 5 parts by weight). This mixture is introduced into 30 parts by weight of water by means of an emulsifier (e.g. Ultraturax) and made into a homogeneous emulsion. Dilution with water gives an emulsion. The formulation has an active compound content of 25% by weight.

E Suspensions

In an agitated ball mill, 20 parts by weight of active compound are comminuted with addition of 10 parts by weight of dispersants and wetters and 70 parts by weight of water or an organic solvent to give a fine active compound suspension. Dilution with water gives a stable suspension of the active compound. The active compound content in the formulation is 20% by weight.

F Water-Dispersible Granules and Water-Soluble Granules

50 parts by weight of active compound are ground finely with addition of 50 parts by weight of dispersants and wetters and made into water-dispersible or water-soluble granules by means of technical appliances (for example extrusion, spray tower, fluidized bed). Dilution with water gives a stable dispersion or solution of the active compound. The formulation has an active compound content of 50% by weight.

G Water-Dispersible Powders and Water-Soluble Powders

75 parts by weight of active compound are ground in a rotor-stator mill with addition of 25 parts by weight of dispersants, wetters and silica gel. Dilution with water gives a stable dispersion or solution of the active compound. The active compound content of the formulation is 75% by weight.

H Gel Formulations

In a ball mill, 20 parts by weight of active compound, 10 parts by weight of dispersant, 1 part by weight of gelling agent and 70 parts by weight of water or of an organic solvent are ground to give a fine suspension. Dilution with water gives a stable suspension with active compound content of 20% by weight.

2. Products to be Applied Undiluted

I Dusts

5 parts by weight of active compound are ground finely and mixed intimately with 95 parts by weight of finely divided kaolin. This gives a dusting powder with an active compound content of 5% by weight.

J Granules (GR, FG, GG, MG)

0.5 parts by weight of active compound are ground finely and associated with 99.5 parts by weight of carriers. Current methods here are extrusion, spray-drying or the fluidized bed. This gives granules to be applied undiluted with an active compound content of 0.5% by weight.

K ULV Solutions (UL)

10 parts by weight of active compound are dissolved in 90 parts by weight of an organic solvent, for example xylene. This gives a product to be applied undiluted with an active compound content of 10% by weight.

The compounds of formula I or the herbicidal compositions comprising them can be applied pre- or post-emergence, or together with the seed of a crop plant. It is also possible to apply the herbicidal compositions or active compounds by applying seed, pretreated with the herbicidal compositions or active compounds, of a crop plant. If the active compounds are less well tolerated by certain crop plants, application techniques may be used in which the herbicidal compositions are sprayed, with the aid of the spraying equipment, in such a

way that as far as possible they do not come into contact with the leaves of the sensitive crop plants, while the active compounds reach the leaves of undesirable plants growing underneath, or the bare soil surface (post-directed, lay-by).

In a further embodiment, the compounds of formula I or the herbicidal compositions can be applied by treating seed.

The treatment of seed comprises essentially all procedures familiar to the person skilled in the art (seed dressing, seed coating, seed dusting, seed soaking, seed film coating, seed multilayer coating, seed encrusting, seed dripping and seed pelleting) based on the compounds of formula I according to the invention or the compositions prepared therefrom. Here, the herbicidal compositions can be applied diluted or undiluted.

The term seed comprises seed of all types, such as, for example, corns, seeds, fruits, tubers, cuttings and similar forms. Here, preferably, the term seed describes corns and seeds.

The seed used can be seed of the useful plants mentioned above, but also the seed of transgenic plants or plants obtained by customary breeding methods.

The rates of application of active compound are from 0.001 to 3.0, preferably 0.01 to 1.0, kg/ha of active substance (a.s.), depending on the control target, the season, the target plants and the growth stage. To treat the seed, the compounds of formula I are generally employed in amounts of from 0.001 to 10 kg per 100 kg of seed.

It may also be advantageous to use the compounds of formula I in combination with safeners. Safeners are chemical compounds which prevent or reduce damage to useful plants without substantially affecting the herbicidal action of the compounds of formula I on unwanted plants. They can be used both before sowing (for example in the treatment of seed, or on cuttings or seedlings) and before or after the emergence of the useful plant. The safeners and the compounds of formula I can be used simultaneously or in succession.

Suitable safeners are, for example, (quinolin-8-oxy)acetic acids, 1-phenyl-5-haloalkyl-1H-1,2,4-triazole-3-carboxylic acids, 1-phenyl-4,5-dihydro-5-alkyl-1H-pyrazole-3,5-dicarboxylic acids, 4,5-dihydro-5,5-diary-3-isoxazolecarboxylic acids, dichloroacetamides, alphaoximinophenylacetoneitriles, acetophenone oximes, 4,6-dihalo-2-phenylpyrimidines, N-[[4-(aminocarbonyl)phenyl]sulfonyl]-2-benzamides, 1,8-naphthalic anhydride, 2-halo-4-(haloalkyl)-5-thiazolecarboxylic acids, phosphorothiolates and O-phenyl N-alkylcarbamates and their agriculturally useful salts and, provided that they have an acid function, their agriculturally useful derivatives, such as amides, esters and thioesters.

To broaden the activity spectrum and to obtain synergistic effects, the compounds of the formula I can be mixed and jointly applied with numerous representatives of other herbicidal or growth-regulating groups of active compounds or with safeners. Suitable mixing partners are, for example, 1,2,4-thiadiazoles, 1,3,4-thiadiazoles, amides, aminophosphoric acid and its derivatives, aminotriazoles, anilides, aryloxy/heteroaryloxyalkanoic acids and their derivatives, benzoic acid and its derivatives, benzothiadiazinones, 2-(heteroaryl/aryl)-1,3-cyclohexanediones, heteroaryl aryl ketones, benzylisoxazolidinones, meta-CF₃-phenyl derivatives, carbamates, quinoline carboxylic acid and its derivatives, chloroacetanilides, cyclohexenone oxime ether derivatives, diazines, dichloropropionic acid and its derivatives, dihydrobenzofurans, dihydrofuran-3-ones, dinitroanilines, dinitrophenols, diphenyl ethers, dipyridyls, halocarboxylic acids and their derivatives, ureas, 3-phenyluracils, imidazoles, imidazolinones, N-phenyl-3,4,5,6-tetrahydrophthal-

imides, oxadiazoles, oxiranes, phenols, aryloxy- and heteroaryloxyphenoxypropionic esters, phenylacetic acid and its derivatives, 2-phenylpropionic acid and its derivatives, pyrazoles, phenylpyrazoles, pyridazines, pyridinecarboxylic acid and its derivatives, pyrimidyl ethers, sulfonamides, sulfonureas, triazines, triazinones, triazolinones, triazolecarboxamides, uracils and also phenylpyrazolines and isoxazolinones and their derivatives.

Moreover, it may be useful to apply the compounds of formula I alone or in combination with other herbicides or else also mixed with further crop protection agents, jointly, for example with compositions for controlling pests or phytopathogenic fungi or bacteria. Also of interest is the miscibility with mineral salt solutions which are employed for alleviating nutritional and trace element deficiencies. Other additives such as nonphytotoxic oils and oil concentrates may also be added.

Examples of herbicides which can be used in combination with the N-(tetrazol-5-yl)- and N-(triazol-5-yl)arylcarboxamide compounds of formula I according to the present invention are:

b1) from the group of the lipid biosynthesis inhibitors:

alloxydim, alloxydim-sodium, butoxydim, clethodim, clodinafop, clodinafop-propargyl, cycloxydim, cyhalofop, cyhalofop-butyl, diclofop, diclofop-methyl, fenoxaprop, fenoxaprop-ethyl, fenoxaprop-P, fenoxaprop-P-ethyl, fluazifop, fluazifop-butyl, fluazifop-P, fluazifop-P-butyl, haloxyfop, haloxyfop-methyl, haloxyfop-P, haloxyfop-P-methyl, metamifop, pinoxaden, profoxydim, propaquizafop, quizalofop, quizalofop-ethyl, quizalofop-tefuryl, quizalofop-P, quizalofop-P-ethyl, quizalofop-P-tefuryl, sethoxydim, tepraloxym, tralkoxydim, benfuresate, butylate, cycloate, dalapon, dimepiperate, EPTC, esprocarb, ethofumesate, flupropanate, molinate, orben carb, pebulate, prosulfocarb, TCA, thiobencarb, tiocarbamil, triallate and vernolate;

b2) from the group of the ALS inhibitors:

amidosulfuron, azimsulfuron, bensulfuron, bensulfuron-methyl, bispyribac, bispyribacsodium, chlorimuron, chlorimuron-ethyl, chlorsulfuron, cinosulfuron, cloransulam, cloransulam-methyl, cyclosulfamuron, diclosulam, ethametsulfuron, ethametsulfuron-methyl, ethoxysulfuron, flazasulfuron, florasulam, flucarbazone, flucarbazone-sodium, flucetosulfuron, flumetsulam, flupyr-sulfuron, flupyr-sulfuron-methyl-sodium, foramsulfuron, halosulfuron, halosulfuron-methyl, imazamethabenz, imazamethabenz-methyl, imazamox, imazapic, imazapyr, imazaquin, imazethapyr, imazosulfuron, iodosulfuron, iodosulfuron-methyl-sodium, mesosulfuron, metosulam, metsulfuron, metsulfuron-methyl, nicosulfuron, orthosulfamuron, oxasulfuron, penoxsulam, primisulfuron, primisulfuron-methyl, propoxycarbazone, propoxycarbazone-sodium, prosulfuron, pyrazosulfuron, pyrazosulfuron-ethyl, pyribenzoxim, pyrimisulfan, pyriftalid, pyriminobac, pyriminobac-methyl, pyri-thiobac, pyri-thiobac-sodium, pyroxsulam, rimsulfuron, sulfometuron, sulfometuron-methyl, sulfosulfuron, thien-carbazone, thien-carbazone-methyl, thifensulfuron, thifensulfuron-methyl, triasulfuron, tribenuron, tribenuron-methyl, trifloxysulfuron, triflusulfuron, triflusulfuron-methyl and tritosulfuron;

b3) from the group of the photosynthesis inhibitors:

ametryn, amicarbazone, atrazine, bentazone, bentazone-sodium, bromacil, bromofenoxim, bromoxynil and its salts and esters, chlorobromuron, chloridazone, chlorotoluron, chloroxuron, cyanazine, desmedipham, desmetryn, dimefuron, dimethametryn, diquat, diquatdibromide, diuron, flumeturon, hexazinone, ioxynil and its salts and esters, isoproturon, isouron, karbutilate, lenacil, linuron, metamitron,

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methabenzthiazuron, metobenzuron, metoxuron, metribuzin, monolinuron, neburon, paraquat, paraquat-dichloride, paraquatdimethylsulfate, pentanochlor, phenmedipham, phenmedipham-ethyl, prometon, prometryn, propanil, propazine, pyridafol, pyridate, siduron, simazine, simetryn, tebuthiuron, terbacil, terbumeton, terbutylazine, terbutryn, thidiazuron and trietazine;

b4) from the group of the protoporphyrinogen-IX oxidase inhibitors:

acifluorfen, acifluorfen-sodium, azafenidin, bencarbazone, benzfendizone, bifenox, butafenacil, carfentrazone, carfentrazone-ethyl, chlormethoxyfen, cinidon-ethyl, flualozate, flufenpyr, flufenpyr-ethyl, flumiclorac, flumiclorac-pentyl, flumioxazin, fluoroglycofen, fluoroglycofen-ethyl, fluthiacet, fluthiacet-methyl, fomesafen, halosafen, lactofen, oxadiargyl, oxadiazon, oxyfluorfen, pentoxazone, proflumazol, pyraclostrobin, pyraflufen, pyraflufen-ethyl, saflufenacil, sulfentrazone, thidiazimin, 2-chloro-5-[3,6-dihydro-3-methyl-2,6-dioxo-4-(trifluoromethyl)-1(2H-pyrimidinyl)-4-fluoro-N-[(isopropyl)methylsulfamoyl]benzamide (H-1; CAS 372137-35-4), ethyl[3-[2-chloro-4-fluoro-5-(1-methyl-6-trifluoromethyl-2,4-dioxo-1,2,3,4-tetrahydropyrimidin-3-yl)phenoxy]-2-pyridyloxy]acetate (H-2; CAS 353292-31-6), N-ethyl-3-(2,6-dichloro-4-trifluoromethylphenoxy)-5-methyl-1H-pyrazole-1-carboxamide (H-3; CAS 452098-92-9), N-tetrahydrofurfuryl-3-(2,6-dichloro-4-trifluoromethylphenoxy)-5-methyl-1H-pyrazole-1-carboxamide (H-4; CAS 915396-43-9), N-ethyl-3-(2-chloro-6-fluoro-4-trifluoromethylphenoxy)-5-methyl-1H-pyrazole-1-carboxamide (H-5; CAS 452099-05-7), N-tetrahydrofurfuryl-3-(2-chloro-6-fluoro-4-trifluoromethylphenoxy)-5-methyl-1H-pyrazole-1-carboxamide (H-6; CAS 45100-03-7), 3-[7-fluoro-3-oxo-4-(prop-2-ynyl)-3,4-dihydro-2H-benzo[1,4]oxazin-6-yl]-1,5-dimethyl-6-thioxo-[1,3,5]triazinan-2,4-dione, 1,5-dimethyl-6-thioxo-3-(2,2,7-trifluoro-3-oxo-4-(prop-2-ynyl)-3,4-dihydro-2H-benzo[b][1,4]oxazin-6-yl)-1,3,5-triazinan-2,4-dione, 2-(2,2,7-Trifluoro-3-oxo-4-prop-2-ynyl-3,4-dihydro-2H-benzo[1,4]oxazin-6-yl)-4,5,6,7-tetrahydro-indole-1,3-dione and 1-Methyl-6-trifluoromethyl-3-(2,2,7-trifluoro-3-oxo-4-prop-2-ynyl-3,4-dihydro-2H-benzo[1,4]oxazin-6-yl)-1H-pyrimidine-2,4-dione;

b5) from the group of the bleacher herbicides:

acetonitrile, amitrol, beflubutamide, benzobicyclon, benzenofenap, clomazone, diflufenican, fluridone, flurochloridone, flurtamone, isoxaflutole, mesotrione, norflurazon, picolinafen, pyrasulfotole, pyrazolynate, pyrazoxyfen, sulcotrione, tefuryltrione, tembotrione, topramezone, 4-hydroxy-3-[[2-[(2-methoxyethoxy)methyl]-6-(trifluoromethyl)-3-pyridyl]carbonyl]bicyclo[3.2.1]oct-3-en-2-one (H-7; CAS 352010-68-5) and 4-(3-trifluoromethylphenoxy)-2-(4-trifluoromethylphenyl)pyrimidine (H-8; CAS 180608-33-7);

b6) from the group of the EPSP synthase inhibitors:

glyphosate, glyphosate-isopropylammonium and glyphosate-trimesium (sulfosate);

b7) from the group of the glutamine synthase inhibitors:

bilanaphos (bialaphos), bilanaphos-sodium, glufosinate and glufosinate-ammonium;

b8) from the group of the DHP synthase inhibitors:

asulam;

b9) from the group of the mitose inhibitors:

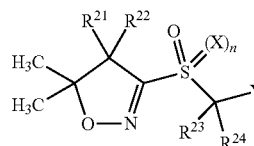
amiprophos, amiprophos-methyl, benfluralin, butamiphos, butralin, carbetamide, chlorpropham, chlorthal, chlorthal-dimethyl, dinitramine, dithiopyr, ethalfluralin, fluchloralin, oryzalin, pendimethalin, prodiamine, proflumazone, propazine, tebutam, thiazopyr and trifluralin;

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b10) from the group of the VLCFA inhibitors:

acetochlor, alachlor, anilofos, butachlor, cafenstrole, dimethachlor, dimethanamid, dimethenamid-P, diphenamid, fentrazamide, flufenacet, mefenacet, metazachlor, metolachlor, metolachlor-S, naproanilide, napropamide, pethoxamid, piperophos, pretilachlor, propachlor, propisochlor, pyroxasulfone (KIH-485) and thenylchlor;

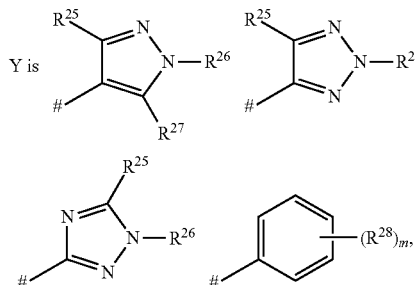
Compounds of the Formula 2:



in which the variables have the following meanings:

Y is phenyl or 5- or 6-membered heteroaryl as defined at the outset, which radicals may be substituted by one to three groups R^{aa} ; R^{21} , R^{22} , R^{23} , R^{24} are H, halogen or C_1 - C_4 -alkyl; X is O or NH; N is 0 or 1.

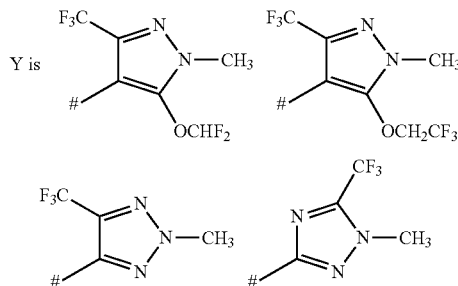
Compounds of the formula 2 have in particular the following meanings:



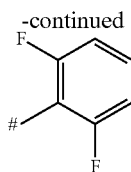
where # denotes the bond to the skeleton of the molecule; and

R^{21} , R^{22} , R^{23} , R^{24} are H, Cl, F or CH_3 ; R^{25} is halogen, C_1 - C_4 -alkyl or C_1 - C_4 -haloalkyl; R^{26} is C_1 - C_4 -alkyl; R^{27} is halogen, C_1 - C_4 -alkoxy or C_1 - C_4 -haloalkoxy; R^{28} is H, halogen, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl or C_1 - C_4 -haloalkoxy; M is 0, 1, 2 or 3; X is oxygen; N is 0 or 1.

Preferred compounds of the formula 2 have the following meanings:



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R²¹ is H; R²², R²³ are F; R²⁴ is H or F; X is oxygen; N is O or 1.

Particularly preferred compounds of the formula 2 are:

3-[5-(2,2-difluoroethoxy)-1-methyl-3-trifluoromethyl-1H-pyrazol-4-ylmethane-sulfonyl]-4-fluoro-5,5-dimethyl-4,5-dihydroisoxazole (2-1); 3-[[5-(2,2-difluoroethoxy)-1-methyl-3-trifluoromethyl-1H-pyrazol-4-yl]fluoromethanesulfonyl]-5,5-dimethyl-4,5-dihydroisoxazole (2-2); 4-(4-fluoro-5,5-dimethyl-4,5-dihydroisoxazole-3-sulfonylmethyl)-2-methyl-5-trifluoromethyl-2H-[1,2,3]triazole (2-3); 4-[(5,5-dimethyl-4,5-dihydroisoxazole-3-sulfonyl)fluoromethyl]-2-methyl-5-trifluoromethyl-2H-[1,2,3]triazole (2-4); 4-(5,5-dimethyl-4,5-dihydroisoxazole-3-sulfonylmethyl)-2-methyl-5-trifluoromethyl-2H-[1,2,3]triazole (2-5); 3-[[5-(2,2-difluoroethoxy)-1-methyl-3-trifluoromethyl-1H-pyrazol-4-yl]difluoromethanesulfonyl]-5,5-dimethyl-4,5-dihydroisoxazole (2-6); 4-[(5,5-dimethyl-4,5-dihydroisoxazole-3-sulfonyl)difluoromethyl]-2-methyl-5-trifluoromethyl-2H-[1,2,3]triazole (2-7); 3-[[5-(2,2-difluoroethoxy)-1-methyl-3-trifluoromethyl-1H-pyrazol-4-yl]difluoromethanesulfonyl]-4-fluoro-5,5-dimethyl-4,5-dihydroisoxazole (2-8); 4-[difluoro-(4-fluoro-5,5-dimethyl-4,5-dihydroisoxazole-3-sulfonyl)methyl]-2-methyl-5-trifluoromethyl-2H-[1,2,3]triazole (2-9);

b11) from the group of the cellulose biosynthesis inhibitors:

chlorthiamid, dichlobenil, flupoxam and isoxaben;

b12) from the group of the decoupler herbicides:

dinoseb, dinoterb and DNOC and its salts;

b13) from the group of the auxin herbicides:

2,4-D and its salts and esters, 2,4-DB and its salts and esters, aminopyralid and its salts such as aminopyralid-tris(2-hydroxypropyl)ammonium and its esters, benazolin, benazolin-ethyl, chloramben and its salts and esters, clomeprop, clopyralid and its salts and esters, dicamba and its salts and esters, dichlorprop and its salts and esters, dichlorprop-P and its salts and esters, fluoroxyppyr, fluoroxyppyr-butomethyl, fluoroxyppyr-meptyl, MCPA and its salts and esters, MCPAthioethyl, MCPB and its salts and esters, mecoprop and its salts and esters, mecoprop-P and its salts and esters, picloram and its salts and esters, quinclorac, quinmerac, TBA (2,3,6) and its salts and esters, triclopyr and its salts and esters, and 5,6-dichloro-2-cyclopropyl-4-pyrimidinecarboxylic acid (H-9; CAS 858956-08-8) and its salts and esters;

b14) from the group of the auxin transport inhibitors: diflufenzopyr, diflufenzopyr-sodium, naptalam and naptalam-sodium;

b15) from the group of the other herbicides: bromobutide, chlorflurenol, chlorflurenolmethyl, cinmethylin, cumyluron, dalapon, dazomet, difenzoquat, difenzoquat-metilsulfate, dimethipin, DSMA, dymron, endothal and its salts, etobenzanid, flamprop, flamprop-isopropyl, flamprop-methyl, flamprop-M-isopropyl, flamprop-M-methyl, flurenol, flurenol-butyl, flurprimidol, fosamine, fosamine-ammonium, indanofan, maleic hydrazide, mefluidide, metam, methyl azide, methyl bromide, methyl-dymron, methyl iodide, MSMA, oleic acid, oxaziclonofone, pelargonic acid, pyributicarb, quinclamine, triaziflam, tridiphane and 6-chloro-3-

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(2-cyclopropyl-6-methylphenoxy)-4-pyridazinol (H-10; CAS 499223-49-3) and its salts and esters.

Examples of preferred safeners C are benoxacor, cloquintocet, cyometrinil, cyprosulfamide, dichlormid, dicyclonone, dietholate, fenclorazole, fenclorim, flurazole, fluxofenim, furilazole, isoxadifen, mefenpyr, mephenate, naphthalic anhydride, oxabetrinil, 4-(dichloroacetyl)-1-oxa-4-azaspiro [4.5]decane (H-11; MON4660, CAS 71526-07-3) and 2,2,5-trimethyl-3-(dichloroacetyl)-1,3-oxazolidine (H-12; R-29148, CAS 52836-31-4).

The active compounds of groups b1) to b15) and the safeners C are known herbicides and safeners, see, for example, The Compendium of Pesticide Common Names (<http://www.alanwood.net/pesticides/>); B. Hock, C. Fedtke, R. R. Schmidt, Herbicide [Herbicides], Georg Thieme Verlag, Stuttgart, 1995. Further herbicidally active compounds are known from WO 96/26202, WO 97/41116, WO 97/41117, WO 97/41118, WO 01/83459 and WO 2008/074991 and from W. Krämer et al. (ed.) "Modern Crop Protection Compounds", Vol. 1, Wiley VCH, 2007 and the literature quoted therein.

The invention also relates to compositions in the form of a crop protection composition formulated as a 1-component composition comprising an active compound combination comprising at least one N-(tetrazol-5-yl)- and N-(triazol-5-yl)arylcarboxamide compound of the formula I and at least one further active compound, preferably selected from the active compounds of groups b1 to b15, and at least one solid or liquid carrier and/or one or more surfactants and, if desired, one or more further auxiliaries customary for crop protection compositions.

The invention also relates to compositions in the form of a crop protection composition formulated as a 2-component composition comprising a first component comprising at least one compound of the formula I, a solid or liquid carrier and/or one or more surfactants and a second component comprising at least one further active compound selected from the active compounds of groups b1 to b15, a solid or liquid carrier and/or one or more surfactants, where additionally both components may also comprise further auxiliaries customary for crop protection compositions.

In binary compositions comprising at least one compound of the formula I as component A and at least one herbicide B, the weight ratio of the active compounds A:B is generally in the range of from 1:1000 to 1000:1, preferably in the range of from 1:500 to 500:1, in particular in the range of from 1:250 to 250:1 and particularly preferably in the range of from 1:75 to 75:1.

In binary compositions comprising at least one compound of the formula I as component A and at least one safener C, the weight ratio of the active compounds A:C is generally in the range of from 1:1000 to 1000:1, preferably in the range of from 1:500 to 500:1, in particular in the range of from 1:250 to 250:1 and particularly preferably in the range of from 1:75 to 75:1.

In ternary compositions comprising both at least one compound of the formula I as component A, at least one herbicide B and at least one safener C, the relative parts by weight of the components A:B are generally in the range of from 1:1000 to 1000:1, preferably in the range of from 1:500 to 500:1, in particular in the range of from 1:250 to 250:1 and particularly preferably in the range of from 1:75 to 75:1; the weight ratio of the components A:C is generally in the range of from 1:1000 to 1000:1, preferably in the range of from 1:500 to 500:1, in particular in the range of from 1:250 to 250:1 and particularly preferably in the range of from 1:75 to 75:1; and the weight ratio of the components B:C is generally in the range of from 1:1000 to 1000:1, preferably in the range of

from 1:500 to 500:1, in particular in the range of from 1:250 to 250:1 and particularly preferably in the range of from 1:75 to 75:1. Preferably, the weight ratio of the components A+B to the component C is in the range of from 1:500 to 500:1, in particular in the range of from 1:250 to 250:1 and particularly preferably in the range of from 1:75 to 75:1.

Examples of particularly preferred compositions according to the invention comprising in each case one individualized compound of the formula I and one mixing partner or a mixing partner combination are given in Table B below.

A further aspect of the invention relates to the compositions B-1 to B-1236 listed in Table B below, where in each case one row of Table B corresponds to a herbicidal composition comprising one of the compounds of formula I individualized in the above description (component 1) and the further active compound from groups b1) to b15) and/or safener C stated in each case in the row in question (component 2). The active compounds in the compositions described are in each case preferably present in synergistically effective amounts.

TABLE B

	Herbicide(s) B	Safener C
B-1	clodinafop-propargyl	—
B-2	cycloxydim	—
B-3	cyhalofop-butyl	—
B-4	fenoxaprop-P-ethyl	—
B-5	pinoxaden	—
B-6	profoxydim	—
B-7	tepraloxydim	—
B-8	tralkoxydim	—
B-9	esprocarb	—
B-10	prosulfocarb	—
B-11	thiobencarb	—
B-12	triallate	—
B-13	bensulfuron-methyl	—
B-14	bispyribac-sodium	—
B-15	cyclosulfamuron	—
B-16	flumetsulam	—
B-17	flupyrsulfuron-methyl-sodium	—
B-18	foramsulfuron	—
B-19	imazamox	—
B-20	imazapic	—
B-21	imazapyr	—
B-22	imazaquin	—
B-23	imazethapyr	—
B-24	imazosulfuron	—
B-25	iodosulfuron-methyl-sodium	—
B-26	mesosulfuron	—
B-27	nicosulfuron	—
B-28	penoxsulam	—
B-29	propoxycarbazone-sodium	—
B-30	pyrazosulfuron-ethyl	—
B-31	pyroxsulam	—
B-32	rimisulfuron	—
B-33	sulfosulfuron	—
B-34	thiencarbazone-methyl	—
B-35	tritosulfuron	—
B-36	2,4-D and its salts and esters	—
B-37	aminopyralid and its salts and esters	—
B-38	clopyralid and its salts and esters	—
B-39	dicamba and its salts and esters	—
B-40	fluroxypyr-meptyl	—
B-41	quinclorac	—
B-42	quinmerac	—
B-43	H-9	—
B-44	diflufenzopyr	—
B-45	diflufenzopyr-sodium	—
B-46	clomazone	—
B-47	diflufenican	—
B-48	fluorochloridone	—
B-49	isoxaflutol	—
B-50	mesotrione	—
B-51	picolinafen	—
B-52	sulcotrione	—

TABLE B-continued

	Herbicide(s) B	Safener C
5	B-53 tefuryltrione	—
	B-54 tembotrione	—
	B-55 topramezone	—
	B-56 H-7	—
	B-57 atrazine	—
	B-58 diuron	—
	B-59 fluometuron	—
10	B-60 hexazinone	—
	B-61 isoproturon	—
	B-62 metribuzin	—
	B-63 propanil	—
	B-64 terbutylazine	—
	B-65 paraquat dichloride	—
15	B-66 flumioxazin	—
	B-67 oxyfluorfen	—
	B-68 saflufenacil	—
	B-69 sulfentrazone	—
	B-70 H-1	—
	B-71 H-2	—
20	B-72 glyphosate	—
	B-73 glyphosate-isopropylammonium	—
	B-74 glyphosate-trimesium (sulfosate)	—
	B-75 glufosinate	—
	B-76 glufosinate-ammonium	—
	B-77 pendimethalin	—
	B-78 trifluralin	—
25	B-79 acetochlor	—
	B-80 cafenstrole	—
	B-81 dimethenamid-P	—
	B-82 fentrazamide	—
	B-83 flufenacet	—
	B-84 mefenacet	—
30	B-85 metazachlor	—
	B-86 metolachlor-S	—
	B-87 pyroxsulfone	—
	B-88 isoxaben	—
	B-89 dymron	—
	B-90 indanofan	—
35	B-91 oxaziclonofone	—
	B-92 triaziflam	—
	B-93 chlorotoluron	—
	B-94 atrazine + H-1	—
	B-95 atrazine + glyphosate	—
	B-96 atrazine + mesotrione	—
	B-97 atrazine + nicosulfuron	—
40	B-98 atrazine + tembotrione	—
	B-99 atrazine + topramezone	—
	B-100 clomazone + glyphosate	—
	B-101 diflufenican + clodinafop-propargyl	—
	B-102 diflufenican + fenoxaprop-P-ethyl	—
	B-103 diflufenican + flupyrsulfuron-methyl-sodium	—
45	B-104 diflufenican + glyphosate	—
	B-105 diflufenican + mesosulfuron-methyl	—
	B-106 diflufenican + pinoxaden	—
	B-107 diflufenican + pyroxsulam	—
	B-108 flumetsulam + glyphosate	—
	B-109 flumioxazin + glyphosate	—
50	B-110 imazapic + glyphosate	—
	B-111 imazethapyr + glyphosate	—
	B-112 isoxaflutol + H-1	—
	B-113 isoxaflutol + glyphosate	—
	B-114 metazachlor + H-1	—
	B-115 metazachlor + glyphosate	—
55	B-116 metazachlor + mesotrione	—
	B-117 metazachlor + nicosulfuron	—
	B-118 metazachlor + terbutylazine	—
	B-119 metazachlor + topramezone	—
	B-120 metribuzin + glyphosate	—
	B-121 pendimethalin + H-1	—
60	B-122 pendimethalin + clodinafop-propargyl	—
	B-123 pendimethalin + fenoxaprop-P-ethyl	—
	B-124 pendimethalin + flupyrsulfuron-methyl-sodium	—
	B-125 pendimethalin + glyphosate	—
	B-126 pendimethalin + mesosulfuron-methyl	—
	B-127 pendimethalin + mesotrione	—
	B-128 pendimethalin + nicosulfuron	—
65	B-129 pendimethalin + pinoxaden	—
	B-130 pendimethalin + pyroxsulam	—

TABLE B-continued

Herbicide(s) B	Safener C
B-131	pendimethalin + tembotrione
B-132	pendimethalin + topamezone
B-133	pyroxasulfone + tembotrione
B-134	pyroxasulfone + topamezone
B-135	sulfentrazone + glyphosate
B-136	terbuthylazine + H-1
B-137	terbuthylazine + foramsulfuron
B-138	terbuthylazine + glyphosate
B-139	terbuthylazine + mesotrione
B-140	terbuthylazine + nicosulfuron
B-141	terbuthylazine + tembotrione
B-142	terbuthylazine + topamezone
B-143	trifluralin + glyphosate
B-144	—
B-145	—
B-146	—
B-147	—
B-148	—
B-149	—
B-150	—
B-151	—
B-152	—
B-153	clodinafop-propargyl
B-154	cycloxydim
B-155	cyhalofop-butyl
B-156	fenoxaprop-P-ethyl
B-157	pinoxaden
B-158	profoxydim
B-159	tepraloxydim
B-160	tralkoxydim
B-161	esprocarb
B-162	prosulfocarb
B-163	thiobencarb
B-164	triallate
B-165	bensulfuron-methyl
B-166	bispyribac-sodium
B-167	cyclosulfamuron
B-168	flumetsulam
B-169	flupyr-sulfuron-methyl-sodium
B-170	foramsulfuron
B-171	imazamox
B-172	imazapic
B-173	imazapyr
B-174	imazaquin
B-175	imazethapyr
B-176	imazosulfuron
B-177	iodosulfuron-methyl-sodium
B-178	mesosulfuron
B-179	nicosulfuron
B-180	penoxsulam
B-181	propoxycarbazone-sodium
B-182	pyrazosulfuron-ethyl
B-183	pyroxulam
B-184	rimisulfuron
B-185	sulfosulfuron
B-186	thiencarbazone-methyl
B-187	tritosulfuron
B-188	2,4-D and its salts and esters
B-189	aminopyralid and its salts and esters
B-190	clopyralid and its salts and esters
B-191	dicamba and its salts and esters
B-192	fluroxypyr-meptyl
B-193	quinclorac
B-194	quinmerac
B-195	H-9
B-196	diflufenzopyr
B-197	diflufenzopyr-sodium
B-198	clomazone
B-199	diflufenican
B-200	fluorochloridone
B-201	isoxaflutol
B-202	mesotrione
B-203	picolinafen
B-204	sulcotrione
B-205	tefuryltrione
B-206	tembotrione
B-207	topamezone
B-208	H-7

TABLE B-continued

Herbicide(s) B	Safener C
B-209	atrazine
B-210	diuron
B-211	fluometuron
B-212	hexazinone
B-213	isoproturon
B-214	metribuzin
B-215	propanil
B-216	terbuthylazine
B-217	paraquat dichloride
B-218	flumioxazin
B-219	oxyfluorfen
B-220	saflufenacil
B-221	sulfentrazone
B-222	H-1
B-223	H-2
B-224	glyphosate
B-225	glyphosate-isopropylammonium
B-226	glyphosate-trimesium (sulfosate)
B-227	glufosinate
B-228	glufosinate-ammonium
B-229	pendimethalin
B-230	trifluralin
B-231	acetochlor
B-232	cafenstrole
B-233	dimethenamid-P
B-234	fentrazamide
B-235	flufenacet
B-236	mefenacet
B-237	metazachlor
B-238	metolachlor-S
B-239	pyroxasulfone
B-240	isoxaben
B-241	dymron
B-242	indanofan
B-243	oxaziclomefone
B-244	triaziflam
B-245	atrazine + H-1
B-246	atrazine + glyphosate
B-247	atrazine + mesotrione
B-248	atrazine + nicosulfuron
B-249	atrazine + tembotrione
B-250	atrazine + topamezone
B-251	clomazone + glyphosate
B-252	diflufenican + clodinafop-propargyl
B-253	diflufenican + fenoxaprop-P-ethyl
B-254	diflufenican + flupyr-sulfuron-methyl-sodium
B-255	diflufenican + glyphosate
B-256	diflufenican + mesosulfuron-methyl
B-257	diflufenican + pinoxaden
B-258	diflufenican + pyroxulam
B-259	flumetsulam + glyphosate
B-260	flumioxazin + glyphosate
B-261	imazapic + glyphosate
B-262	imazethapyr + glyphosate
B-263	isoxaflutol + H-1
B-264	isoxaflutol + glyphosate
B-265	metazachlor + H-1
B-266	metazachlor + glyphosate
B-267	metazachlor + mesotrione
B-268	metazachlor + nicosulfuron
B-269	metazachlor + terbuthylazine
B-270	metazachlor + topamezone
B-271	metribuzin + glyphosate
B-272	pendimethalin + H-1
B-273	pendimethalin + clodinafop-propargyl
B-274	pendimethalin + fenoxaprop-P-ethyl
B-275	pendimethalin + flupyr-sulfuron-methyl-sodium
B-276	pendimethalin + glyphosate
B-277	pendimethalin + mesosulfuron-methyl
B-278	pendimethalin + mesotrione
B-279	pendimethalin + nicosulfuron
B-280	pendimethalin + pinoxaden
B-281	pendimethalin + pyroxulam
B-282	pendimethalin + tembotrione
B-283	pendimethalin + topamezone
B-284	pyroxasulfone + tembotrione
B-285	pyroxasulfone + topamezone
B-286	sulfentrazone + glyphosate

TABLE B-continued

Herbicide(s) B	Safener C
B-287	terbuthylazine + H-1
B-288	terbuthylazine + foramsulfuron
B-289	terbuthylazine + glyphosate
B-290	terbuthylazine + mesotrione
B-291	terbuthylazine + nicosulfuron
B-292	terbuthylazine + tembotrione
B-293	terbuthylazine + topramezone
B-294	trifluralin + glyphosate
B-295	clodinafop-propargyl
B-296	cycloxydim
B-297	cyhalofop-butyl
B-298	fenoxaprop-P-ethyl
B-299	pinoxaden
B-300	profoxydim
B-301	tepraloxydim
B-302	tralkoxydim
B-303	esprocarb
B-304	prosulfocarb
B-305	thiobencarb
B-306	triallate
B-307	bensulfuron-methyl
B-308	bispyribac-sodium
B-309	cyclosulfamuron
B-310	flumetsulam
B-311	flupyr-sulfuron-methyl-sodium
B-312	foramsulfuron
B-313	imazamox
B-314	imazapic
B-315	imazapyr
B-316	imazaquin
B-317	imazethapyr
B-318	imazosulfuron
B-319	iodosulfuron-methyl-sodium
B-320	mesosulfuron
B-321	nicosulfuron
B-322	penoxsulam
B-323	propoxycarbazone-sodium
B-324	pyrazosulfuron-ethyl
B-325	pyroxsulam
B-326	rimsulfuron
B-327	sulfosulfuron
B-328	thiencarbazone-methyl
B-329	tritosulfuron
B-330	2,4-D and its salts and esters
B-331	aminopyralid and its salts and esters
B-332	clopyralid and its salts and esters
B-333	dicamba and its salts and esters
B-334	fluroxypyr-meptyl
B-335	quinclorac
B-336	quinmerac
B-337	H-9
B-338	diflufenopyr
B-339	diflufenopyr-sodium
B-340	clomazone
B-341	diflufenican
B-342	fluorochloridone
B-343	isoxaflutol
B-344	mesotrione
B-345	picolinafen
B-346	sulcotrione
B-347	tefuryltrione
B-348	tembotrione
B-349	topramezone
B-350	H-7
B-351	atrazine
B-352	diuron
B-353	fluometuron
B-354	hexazinone
B-355	isoproturon
B-356	metribuzin
B-357	propanil
B-358	terbuthylazine
B-359	paraquat dichloride
B-360	flumioxazin
B-361	oxyfluorfen
B-362	saflufenacil
B-363	sulfentrazone
B-364	H-1

TABLE B-continued

Herbicide(s) B	Safener C
B-365	H-2
B-366	glyphosate
B-367	glyphosate-isopropylammonium
B-368	glyphosate-trimesium (sulfosate)
B-369	glufosinate
B-370	glufosinate-ammonium
B-371	pendimethalin
B-372	trifluralin
B-373	acetochlor
B-374	cafenstrole
B-375	dimethenamid-P
B-376	fentrazamide
B-377	flufenacet
B-378	mefenacet
B-379	metazachlor
B-380	metolachlor-S
B-381	pyroxasulfone
B-382	isoxaben
B-383	dymron
B-384	indanofan
B-385	oxaziclomefone
B-386	triaziflam
B-387	atrazine + H-1
B-388	atrazine + glyphosate
B-389	atrazine + mesotrione
B-390	atrazine + nicosulfuron
B-391	atrazine + tembotrione
B-392	atrazine + topramezone
B-393	clomazone + glyphosate
B-394	diflufenican + clodinafop-propargyl
B-395	diflufenican + fenoxaprop-p-ethyl
B-396	diflufenican + flupyr-sulfuron-methyl-sodium
B-397	diflufenican + glyphosate
B-398	diflufenican + mesosulfuron-methyl
B-399	diflufenican + pinoxaden
B-400	diflufenican + pyroxsulam
B-401	flumetsulam + glyphosate
B-402	flumioxazin + glyphosate
B-403	imazapic + glyphosate
B-404	imazethapyr + glyphosate
B-405	isoxaflutol + H-1
B-406	isoxaflutol + glyphosate
B-407	metazachlor + H-1
B-408	metazachlor + glyphosate
B-409	metazachlor + mesotrione
B-410	metazachlor + nicosulfuron
B-411	metazachlor + terbuthylazine
B-412	metazachlor + topramezone
B-413	metribuzin + glyphosate
B-414	pendimethalin + H-1
B-415	pendimethalin + clodinafop-propargyl
B-416	pendimethalin + fenoxaprop-P-ethyl
B-417	pendimethalin + flupyr-sulfuron-methyl-sodium
B-418	pendimethalin + glyphosate
B-419	pendimethalin + mesosulfuron-methyl
B-420	pendimethalin + mesotrione
B-421	pendimethalin + nicosulfuron
B-422	pendimethalin + pinoxaden
B-423	pendimethalin + pyroxsulam
B-424	pendimethalin + tembotrione
B-425	pendimethalin + topramezone
B-426	pyroxasulfone + tembotrione
B-427	pyroxasulfone + topramezone
B-428	sulfentrazone + glyphosate
B-429	terbuthylazine + H-1
B-430	terbuthylazine + foramsulfuron
B-431	terbuthylazine + glyphosate
B-432	terbuthylazine + mesotrione
B-433	terbuthylazine + nicosulfuron
B-434	terbuthylazine + tembotrione
B-435	terbuthylazine + topramezone
B-436	trifluralin + glyphosate
B-437	clodinafop-propargyl
B-438	cycloxydim
B-439	cyhalofop-butyl
B-440	fenoxaprop-P-ethyl
B-441	pinoxaden
B-442	profoxydim

TABLE B-continued

Herbicide(s) B	Safener C
B-443	tepraloxymid
B-444	tralkoxydim
B-445	esprocarb
B-446	prosulfocarb
B-447	thiobencarb
B-448	triallate
B-449	bensulfuron-methyl
B-450	bispyribac-sodium
B-451	cyclosulfamuron
B-452	flumetsulam
B-453	flupyr-sulfuron-methyl-sodium
B-454	foramsulfuron
B-455	imazamox
B-456	imazapic
B-457	imazapyr
B-458	imazaquin
B-459	imazethapyr
B-460	imazosulfuron
B-461	iodosulfuron-methyl-sodium
B-462	mesosulfuron
B-463	nicosulfuron
B-464	penoxsulam
B-465	propoxycarbazone-sodium
B-466	pyrazosulfuron-ethyl
B-467	pyroxsulam
B-468	rimisulfuron
B-469	sulfosulfuron
B-470	thiencarbazone-methyl
B-471	tritosulfuron
B-472	2,4-D and its salts and esters
B-473	aminopyralid and its salts and esters
B-474	clopyralid and its salts and esters
B-475	dicamba and its salts and esters
B-476	fluroxypyr-meptyl
B-477	quinclorac
B-478	quinmerac
B-479	H-9
B-480	diflufenopyr
B-481	diflufenopyr-sodium
B-482	clomazone
B-483	diflufenican
B-484	fluorochloridone
B-485	isoxaflutol
B-486	mesotrione
B-487	picolinafen
B-488	sulcotrione
B-489	tefuryltrione
B-490	tembotrione
B-491	topramezone
B-492	H-7
B-493	atrazine
B-494	diuron
B-495	fluometuron
B-496	hexazinone
B-497	isoproturon
B-498	metribuzin
B-499	propanil
B-500	terbuthylazine
B-501	paraquat dichloride
B-502	flumioxazin
B-503	oxyfluorfen
B-504	safinacil
B-505	sulfentrazone
B-506	H-1
B-507	H-2
B-508	glyphosate
B-509	glyphosate-isopropylammonium
B-510	glyphosate-trimesium (sulfosate)
B-511	glufosinate
B-512	glufosinate-ammonium
B-513	pendimethalin
B-514	trifluralin
B-515	acetochlor
B-516	cafenstrole
B-517	dimethenamid-P
B-518	fentrazamide
B-519	flufenacet
B-520	mefenacet

TABLE B-continued

Herbicide(s) B	Safener C
B-521	metazachlor
B-522	metolachlor-S
B-523	pyroxasulfone
B-524	isoxaben
B-525	dymron
B-526	indanofan
B-527	oxazicloromefene
B-528	triaziflam
B-529	atrazine + H-1
B-530	atrazine + glyphosate
B-531	atrazine + mesotrione
B-532	atrazine + nicosulfuron
B-533	atrazine + tembotrione
B-534	atrazine + topamezone
B-535	clomazone + glyphosate
B-536	diflufenican + clodinafop-propargyl
B-537	diflufenican + fenoxaprop-p-ethyl
B-538	diflufenican + flupyr-sulfuron-methyl-sodium
B-539	diflufenican + glyphosate
B-540	diflufenican + mesosulfuron-methyl
B-541	diflufenican + pinoxaden
B-542	diflufenican + pyroxsulam
B-543	flumetsulam + glyphosate
B-544	flumioxazin + glyphosate
B-545	imazapic + glyphosate
B-546	imazethapyr + glyphosate
B-547	isoxaflutol + H-1
B-548	isoxaflutol + glyphosate
B-549	metazachlor + H-1
B-550	metazachlor + glyphosate
B-551	metazachlor + mesotrione
B-552	metazachlor + nicosulfuron
B-553	metazachlor + terbuthylazine
B-554	metazachlor + topamezone
B-555	metribuzin + glyphosate
B-556	pendimethalin + H-1
B-557	pendimethalin + clodinafop-propargyl
B-558	pendimethalin + fenoxaprop-P-ethyl
B-559	pendimethalin + flupyr-sulfuron-methyl-sodium
B-560	pendimethalin + glyphosate
B-561	pendimethalin + mesosulfuron-methyl
B-562	pendimethalin + mesotrione
B-563	pendimethalin + nicosulfuron
B-564	pendimethalin + pinoxaden
B-565	pendimethalin + pyroxsulam
B-566	pendimethalin + tembotrione
B-567	pendimethalin + topamezone
B-568	pyroxasulfone + tembotrione
B-569	pyroxasulfone + topamezone
B-570	sulfentrazone + glyphosate
B-571	terbuthylazine + H-1
B-572	terbuthylazine + foramsulfuron
B-573	terbuthylazine + glyphosate
B-574	terbuthylazine + mesotrione
B-575	terbuthylazine + nicosulfuron
B-576	terbuthylazine + tembotrione
B-577	terbuthylazine + topamezone
B-578	trifluralin + glyphosate
B-579	clodinafop-propargyl
B-580	cycloxydim
B-581	cyhalofop-butyl
B-582	fenoxaprop-P-ethyl
B-583	pinoxaden
B-584	profoxydim
B-585	tepraloxymid
B-586	tralkoxydim
B-587	esprocarb
B-588	prosulfocarb
B-589	thiobencarb
B-590	triallate
B-591	bensulfuron-methyl
B-592	bispyribac-sodium
B-593	cyclosulfamuron
B-594	flumetsulam
B-595	flupyr-sulfuron-methyl-sodium
B-596	foramsulfuron
B-597	imazamox
B-598	imazapic

TABLE B-continued

Herbicide(s) B	Safener C
B-599 imazapyr	fenchlorazole
B-600 imazaquin	fenchlorazole
B-601 imazethapyr	fenchlorazole
B-602 imazosulfuron	fenchlorazole
B-603 iodosulfuron-methyl-sodium	fenchlorazole
B-604 mesosulfuron	fenchlorazole
B-605 nicosulfuron	fenchlorazole
B-606 penoxsulam	fenchlorazole
B-607 propoxycarbazone-sodium	fenchlorazole
B-608 pyrazosulfuron-ethyl	fenchlorazole
B-609 pyroxsulam	fenchlorazole
B-610 rimsulfuron	fenchlorazole
B-611 sulfosulfuron	fenchlorazole
B-612 thiencazone-methyl	fenchlorazole
B-613 tritosulfuron	fenchlorazole
B-614 2,4-D and its salts and esters	fenchlorazole
B-615 aminopyralid and its salts and esters	fenchlorazole
B-616 clopyralid and its salts and esters	fenchlorazole
B-617 dicamba and its salts and esters	fenchlorazole
B-618 fluroxypyr-meptyl	fenchlorazole
B-619 quinclorac	fenchlorazole
B-620 quinmerac	fenchlorazole
B-621 H-9	fenchlorazole
B-622 diflufenzopyr	fenchlorazole
B-623 diflufenzopyr-sodium	fenchlorazole
B-624 clomazone	fenchlorazole
B-625 diflufenican	fenchlorazole
B-626 fluorochloridone	fenchlorazole
B-627 isoxaflutol	fenchlorazole
B-628 mesotrione	fenchlorazole
B-629 picolinafen	fenchlorazole
B-630 sulcotrione	fenchlorazole
B-631 tefuryltrione	fenchlorazole
B-632 tembotrione	fenchlorazole
B-633 topramezone	fenchlorazole
B-634 H-7	fenchlorazole
B-635 atrazine	fenchlorazole
B-636 diuron	fenchlorazole
B-637 fluometuron	fenchlorazole
B-638 hexazinone	fenchlorazole
B-639 isoproturon	fenchlorazole
B-640 metribuzin	fenchlorazole
B-641 propanil	fenchlorazole
B-642 terbutylazine	fenchlorazole
B-643 paraquat dichloride	fenchlorazole
B-644 flumioxazin	fenchlorazole
B-645 oxyfluorfen	fenchlorazole
B-646 saflufenacil	fenchlorazole
B-647 sulfentrazone	fenchlorazole
B-648 H-1	fenchlorazole
B-649 H-2	fenchlorazole
B-650 glyphosate	fenchlorazole
B-651 glyphosate-isopropylammonium	fenchlorazole
B-652 glyphosate-trimesium (sulfosate)	fenchlorazole
B-653 glufosinate	fenchlorazole
B-654 glufosinate-ammonium	fenchlorazole
B-655 pendimethalin	fenchlorazole
B-656 trifluralin	fenchlorazole
B-657 acetochlor	fenchlorazole
B-658 cafenstrole	fenchlorazole
B-659 dimethenamid-P	fenchlorazole
B-660 fentrazamide	fenchlorazole
B-661 flufenacet	fenchlorazole
B-662 mefenacet	fenchlorazole
B-663 metazachlor	fenchlorazole
B-664 metolachlor-S	fenchlorazole
B-665 pyroxasulfone	fenchlorazole
B-666 isoxaben	fenchlorazole
B-667 dymron	fenchlorazole
B-668 indanofan	fenchlorazole
B-669 oxaziclomefone	fenchlorazole
B-670 triaziflam	fenchlorazole
B-671 atrazine + H-1	fenchlorazole
B-672 atrazine + glyphosate	fenchlorazole
B-673 atrazine + mesotrione	fenchlorazole
B-674 atrazine + nicosulfuron	fenchlorazole
B-675 atrazine + tembotrione	fenchlorazole
B-676 atrazine + topamezone	fenchlorazole

TABLE B-continued

Herbicide(s) B	Safener C
B-677 clomazone + glyphosate	fenchlorazole
B-678 diflufenican + clodinafop-propargyl	fenchlorazole
B-679 diflufenican + fenoxaprop-P-ethyl	fenchlorazole
B-680 diflufenican + flupyr-sulfuron-methyl-sodium	fenchlorazole
B-681 diflufenican + glyphosate	fenchlorazole
B-682 diflufenican + mesosulfuron-methyl	fenchlorazole
B-683 diflufenican + pinoxaden	fenchlorazole
B-684 diflufenican + pyroxsulam	fenchlorazole
B-685 flumetsulam + glyphosate	fenchlorazole
B-686 flumioxazin + glyphosate	fenchlorazole
B-687 imazapic + glyphosate	fenchlorazole
B-688 imazethapyr + glyphosate	fenchlorazole
B-689 isoxaflutol + H-1	fenchlorazole
B-690 isoxaflutol + glyphosate	fenchlorazole
B-691 metazachlor + H-1	fenchlorazole
B-692 metazachlor + glyphosate	fenchlorazole
B-693 metazachlor + mesotrione	fenchlorazole
B-694 metazachlor + nicosulfuron	fenchlorazole
B-695 metazachlor + terbutylazine	fenchlorazole
B-696 metazachlor + topamezone	fenchlorazole
B-697 metribuzin + glyphosate	fenchlorazole
B-698 pendimethalin + H-1	fenchlorazole
B-699 pendimethalin + clodinafop-propargyl	fenchlorazole
B-700 pendimethalin + fenoxaprop-P-ethyl	fenchlorazole
B-701 pendimethalin + flupyr-sulfuron-methyl-sodium	fenchlorazole
B-702 pendimethalin + glyphosate	fenchlorazole
B-703 pendimethalin + mesosulfuron-methyl	fenchlorazole
B-704 pendimethalin + mesotrione	fenchlorazole
B-705 pendimethalin + nicosulfuron	fenchlorazole
B-706 pendimethalin + pinoxaden	fenchlorazole
B-707 pendimethalin + pyroxsulam	fenchlorazole
B-708 pendimethalin + tembotrione	fenchlorazole
B-709 pendimethalin + topamezone	fenchlorazole
B-710 pyroxasulfone + tembotrione	fenchlorazole
B-711 pyroxasulfone + topamezone	fenchlorazole
B-712 sulfentrazone + glyphosate	fenchlorazole
B-713 terbutylazine + H-1	fenchlorazole
B-714 terbutylazine + foramsulfuron	fenchlorazole
B-715 terbutylazine + glyphosate	fenchlorazole
B-716 terbutylazine + mesotrione	fenchlorazole
B-717 terbutylazine + nicosulfuron	fenchlorazole
B-718 terbutylazine + tembotrione	fenchlorazole
B-719 terbutylazine + topamezone	fenchlorazole
B-720 trifluralin + glyphosate	fenchlorazole
B-721 clodinafop-propargyl	isoxadifen
B-722 cycloxydim	isoxadifen
B-723 cyhalofop-butyl	isoxadifen
B-724 fenoxaprop-P-ethyl	isoxadifen
B-725 pinoxaden	isoxadifen
B-726 profoxydim	isoxadifen
B-727 tepraloxymid	isoxadifen
B-728 tralkoxydim	isoxadifen
B-729 esprocarb	isoxadifen
B-730 prosulfocarb	isoxadifen
B-731 thibencarb	isoxadifen
B-732 triallate	isoxadifen
B-733 bensulfuron-methyl	isoxadifen
B-734 bispyribac-sodium	isoxadifen
B-735 cyclosulfamuron	isoxadifen
B-736 flumetsulam	isoxadifen
B-737 flupyr-sulfuron-methyl-sodium	isoxadifen
B-738 foramsulfuron	isoxadifen
B-739 imazamox	isoxadifen
B-740 imazapic	isoxadifen
B-741 imazapyr	isoxadifen
B-742 imazaquin	isoxadifen
B-743 imazethapyr	isoxadifen
B-744 imazosulfuron	isoxadifen
B-745 iodosulfuron-methyl-sodium	isoxadifen
B-746 mesosulfuron	isoxadifen
B-747 nicosulfuron	isoxadifen
B-748 penoxsulam	isoxadifen
B-749 propoxycarbazone-sodium	isoxadifen
B-750 pyrazosulfuron-ethyl	isoxadifen
B-751 pyroxsulam	isoxadifen
B-752 rimsulfuron	isoxadifen
B-753 sulfosulfuron	isoxadifen
B-754 thiencazone-methyl	isoxadifen

TABLE B-continued

Herbicide(s) B	Safener C
B-755	tritosulfuron
B-756	2,4-D and its salts and esters
B-757	aminopyralid and its salts and esters
B-758	clopyralid and its salts and esters
B-759	dicamba and its salts and esters
B-760	fluroxypyr-meptyl
B-761	quinclorac
B-762	quinmerac
B-763	H-9
B-764	diflufenzopyr
B-765	diflufenzopyr-sodium
B-766	clomazone
B-767	diflufenican
B-768	fluorochloridone
B-769	isoxaflutol
B-770	mesotrione
B-771	picolinafen
B-772	sulcotrione
B-773	tefuryltrione
B-774	tembotrione
B-775	topramezone
B-776	H-7
B-777	atrazine
B-778	diuron
B-779	fluometuron
B-780	hexazinone
B-781	isoproturon
B-782	metribuzin
B-783	propanil
B-784	terbuthylazine
B-785	paraquat dichloride
B-786	flumioxazin
B-787	oxyfluorfen
B-788	saflufenacil
B-789	sulfentrazone
B-790	H-1
B-791	H-2
B-792	glyphosate
B-793	glyphosate-isopropylammonium
B-794	glyphosate-trimesium (sulfosate)
B-795	glufosinate
B-796	glufosinate-ammonium
B-797	pendimethalin
B-798	trifluralin
B-799	acetochlor
B-800	cafenstrole
B-801	dimethenamid-P
B-802	fentrazamide
B-803	flufenacet
B-804	mefenacet
B-805	metazachlor
B-806	metolachlor-S
B-807	pyroxasulfone
B-808	isoxaben
B-809	dymron
B-810	indanofan
B-811	oxaziclomefone
B-812	triaziflam
B-813	atrazine + H-1
B-814	atrazine + glyphosate
B-815	atrazine + mesotrione
B-816	atrazine + nicosulfuron
B-817	atrazine + tembotrione
B-818	atrazine + topramezone
B-819	clomazone + glyphosate
B-820	diflufenican + clodinafop-propargyl
B-821	diflufenican + fenoxaprop-P-ethyl
B-822	diflufenican + flupyr-sulfuron-methyl-sodium
B-823	diflufenican + glyphosate
B-824	diflufenican + mesosulfuron-methyl
B-825	diflufenican + pinoxaden
B-826	diflufenican + pyroxsulam
B-827	flumetsulam + glyphosate
B-828	flumioxazin + glyphosate
B-829	imazapic + glyphosate
B-830	imazethapyr + glyphosate
B-831	isoxaflutol + H-1
B-832	isoxaflutol + glyphosate

TABLE B-continued

Herbicide(s) B	Safener C
B-833	metazachlor + H-1
B-834	metazachlor + glyphosate
B-835	metazachlor + mesotrione
B-836	metazachlor + nicosulfuron
B-837	metazachlor + terbuthylazine
B-838	metazachlor + topramezone
B-839	metribuzin + glyphosate
B-840	pendimethalin + H-1
B-841	pendimethalin + clodinafop-propargyl
B-842	pendimethalin + fenoxaprop-P-ethyl
B-843	pendimethalin + flupyr-sulfuron-methyl-sodium
B-844	pendimethalin + glyphosate
B-845	pendimethalin + mesosulfuron-methyl
B-846	pendimethalin + mesotrione
B-847	pendimethalin + nicosulfuron
B-848	pendimethalin + pinoxaden
B-849	pendimethalin + pyroxsulam
B-850	pendimethalin + tembotrione
B-851	pendimethalin + topramezone
B-852	pyroxasulfone + tembotrione
B-853	pyroxasulfone + topramezone
B-854	sulfentrazone + glyphosate
B-855	terbuthylazine + H-1
B-856	terbuthylazine + foramsulfuron
B-857	terbuthylazine + glyphosate
B-858	terbuthylazine + mesotrione
B-859	terbuthylazine + nicosulfuron
B-860	terbuthylazine + tembotrione
B-861	terbuthylazine + topramezone
B-862	trifluralin + glyphosate
B-863	clodinafop-propargyl
B-864	cycloxydim
B-865	cyhalofop-butyl
B-866	fenoxaprop-P-ethyl
B-867	pinoxaden
B-868	profoxydim
B-869	tepraloxydim
B-870	tralkoxydim
B-871	esprocarb
B-872	prosulfocarb
B-873	thiobencarb
B-874	triallate
B-875	bensulfuron-methyl
B-876	bispyribac-sodium
B-877	cyclosulfamuron
B-878	flumetsulam
B-879	flupyr-sulfuron-methyl-sodium
B-880	foramsulfuron
B-881	imazamox
B-882	imazapic
B-883	imazapyr
B-884	imazaquin
B-885	imazethapyr
B-886	imazosulfuron
B-887	iodosulfuron-methyl-sodium
B-888	mesosulfuron
B-889	nicosulfuron
B-890	penoxsulam
B-891	propoxycarbazone-sodium
B-892	pyrazosulfuron-ethyl
B-893	pyroxsulam
B-894	rimsulfuron
B-895	sulfosulfuron
B-896	thiencarbazone-methyl
B-897	tritosulfuron
B-898	2,4-D and its salts and esters
B-899	aminopyralid and its salts and esters
B-900	clopyralid and its salts and esters
B-901	dicamba and its salts and esters
B-902	fluroxypyr-meptyl
B-903	quinclorac
B-904	quinmerac
B-905	H-9
B-906	diflufenzopyr
B-907	diflufenzopyr-sodium
B-908	clomazone
B-909	diflufenican
B-910	fluorochloridone

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TABLE B-continued

Herbicide(s) B	Safener C
B-911 isoxaflutol	mefenpyr
B-912 mesotrione	mefenpyr
B-913 picolinafen	mefenpyr
B-914 sulcotrione	mefenpyr
B-915 tefuryltrione	mefenpyr
B-916 tembotrione	mefenpyr
B-917 topramezone	mefenpyr
B-918 H-7	mefenpyr
B-919 atrazine	mefenpyr
B-920 diuron	mefenpyr
B-921 fluometuron	mefenpyr
B-922 hexazinone	mefenpyr
B-923 isoproturon	mefenpyr
B-924 metribuzin	mefenpyr
B-925 propanil	mefenpyr
B-926 terbutylazine	mefenpyr
B-927 paraquat dichloride	mefenpyr
B-928 flumioxazin	mefenpyr
B-929 oxyfluorfen	mefenpyr
B-930 saflufenacil	mefenpyr
B-931 sulfentrazone	mefenpyr
B-932 H-1	mefenpyr
B-933 H-2	mefenpyr
B-934 glyphosate	mefenpyr
B-935 glyphosate-isopropylammonium	mefenpyr
B-936 glyphosate-trimesium (sulfosate)	mefenpyr
B-937 glufosinate	mefenpyr
B-938 glufosinate-ammonium	mefenpyr
B-939 pendimethalin	mefenpyr
B-940 trifluralin	mefenpyr
B-941 acetochlor	mefenpyr
B-942 cafenstrole	mefenpyr
B-943 dimethenamid-P	mefenpyr
B-944 fentazamide	mefenpyr
B-945 flufenacet	mefenpyr
B-946 mefenacet	mefenpyr
B-947 metazachlor	mefenpyr
B-948 metolachlor-S	mefenpyr
B-949 pyroxasulfone	mefenpyr
B-950 isoxaben	mefenpyr
B-951 dymron	mefenpyr
B-952 indanofan	mefenpyr
B-953 oxaziclonmefone	mefenpyr
B-954 triaziflam	mefenpyr
B-955 atrazine + H-1	mefenpyr
B-956 atrazine + glyphosate	mefenpyr
B-957 atrazine + mesotrione	mefenpyr
B-958 atrazine + nicosulfuron	mefenpyr
B-959 atrazine + tembotrione	mefenpyr
B-960 atrazine + topramezone	mefenpyr
B-961 clomazone + glyphosate	mefenpyr
B-962 diflufenican + clodinafop-propargyl	mefenpyr
B-963 diflufenican + fenoxaprop-P-ethyl	mefenpyr
B-964 diflufenican + flupyr-sulfuron-methyl-sodium	mefenpyr
B-965 diflufenican + glyphosate	mefenpyr
B-966 diflufenican + mesosulfuron-methyl	mefenpyr
B-967 diflufenican + pinoxaden	mefenpyr
B-968 diflufenican + pyroxsulam	mefenpyr
B-969 flumetsulam + glyphosate	mefenpyr
B-970 flumioxazin + glyphosate	mefenpyr
B-971 imazapic + glyphosate	mefenpyr
B-972 imazethapyr + glyphosate	mefenpyr
B-973 isoxaflutol + H-1	mefenpyr
B-974 isoxaflutol + glyphosate	mefenpyr
B-975 metazachlor + H-1	mefenpyr
B-976 metazachlor + glyphosate	mefenpyr
B-977 metazachlor + mesotrione	mefenpyr
B-978 metazachlor + nicosulfuron	mefenpyr
B-979 metazachlor + terbutylazine	mefenpyr
B-980 metazachlor + topramezone	mefenpyr
B-981 metribuzin + glyphosate	mefenpyr
B-982 pendimethalin + H-1	mefenpyr
B-983 pendimethalin + clodinafop-propargyl	mefenpyr
B-984 pendimethalin + fenoxaprop-P-ethyl	mefenpyr
B-985 pendimethalin + flupyr-sulfuron-methyl-sodium	mefenpyr
B-986 pendimethalin + glyphosate	mefenpyr
B-987 pendimethalin + mesosulfuron-methyl	mefenpyr
B-988 pendimethalin + mesotrione	mefenpyr

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TABLE B-continued

Herbicide(s) B	Safener C
B-989 pendimethalin + nicosulfuron	mefenpyr
B-990 pendimethalin + pinoxaden	mefenpyr
B-991 pendimethalin + pyroxsulam	mefenpyr
B-992 pendimethalin + tembotrione	mefenpyr
B-993 pendimethalin + topramezone	mefenpyr
B-994 pyroxasulfone + tembotrione	mefenpyr
B-995 pyroxasulfone + topramezone	mefenpyr
B-996 sulfentrazone + glyphosate	mefenpyr
B-997 terbutylazine + H-1	mefenpyr
B-998 terbutylazine + foramsulfuron	mefenpyr
B-999 terbutylazine + glyphosate	mefenpyr
B-1000 terbutylazine + mesotrione	mefenpyr
B-1001 terbutylazine + nicosulfuron	mefenpyr
B-1002 terbutylazine + tembotrione	mefenpyr
B-1003 terbutylazine + topramezone	mefenpyr
B-1004 trifluralin + glyphosate	mefenpyr
B-1005 clodinafop-propargyl	H-12
B-1006 cycloxydim	H-12
B-1007 cyhalofop-butyl	H-12
B-1008 fenoxaprop-P-ethyl	H-12
B-1009 pinoxaden	H-12
B-1010 profoxydim	H-12
B-1011 tepraloxym	H-12
B-1012 tralkoxydim	H-12
B-1013 esprocarb	H-12
B-1014 prosulfocarb	H-12
B-1015 thiobencarb	H-12
B-1016 triallate	H-12
B-1017 bensulfuron-methyl	H-12
B-1018 bispyribac-sodium	H-12
B-1019 cyclosulfamuron	H-12
B-1020 flumetsulam	H-12
B-1021 flupyr-sulfuron-methyl-sodium	H-12
B-1022 foramsulfuron	H-12
B-1023 imazamox	H-12
B-1024 imazapic	H-12
B-1025 imazapyr	H-12
B-1026 imazaquin	H-12
B-1027 imazethapyr	H-12
B-1028 imazosulfuron	H-12
B-1029 iodosulfuron-methyl-sodium	H-12
B-1030 mesosulfuron	H-12
B-1031 nicosulfuron	H-12
B-1032 penoxsulam	H-12
B-1033 propoxycarbazon-sodium	H-12
B-1034 pyrazosulfuron-ethyl	H-12
B-1035 pyroxsulam	H-12
B-1036 rimsulfuron	H-12
B-1037 sulfosulfuron	H-12
B-1038 thiencarbazone-methyl	H-12
B-1039 tritosulfuron	H-12
B-1040 2,4-D and its salts and esters	H-12
B-1041 aminopyralid and its salts and esters	H-12
B-1042 clopyralid and its salts and esters	H-12
B-1043 dicamba and its salts and esters	H-12
B-1044 fluroxypyr-meptyl	H-12
B-1045 quinclorac	H-12
B-1046 quinmerac	H-12
B-1047 B-9	H-12
B-1048 diflufenzopyr	H-12
B-1049 diflufenzopyr-sodium	H-12
B-1050 clomazone	H-12
B-1051 diflufenican	H-12
B-1052 fluoro-chloridone	H-12
B-1053 isoxaflutol	H-12
B-1054 mesotrione	H-12
B-1055 picolinafen	H-12
B-1056 sulcotrione	H-12
B-1057 tefuryltrione	H-12
B-1058 tembotrione	H-12
B-1059 topramezone	H-12
B-1060 H-7	H-12
B-1061 atrazine	H-12
B-1062 diuron	H-12
B-1063 fluometuron	H-12
B-1064 hexazinone	H-12
B-1065 isoproturon	H-12
B-1066 metribuzin	H-12

TABLE B-continued

	Herbicide(s) B	Safener C
B-1067	propanil	H-12
B-1068	terbuthylazine	H-12
B-1069	paraquat dichloride	H-12
B-1070	flumioxazin	H-12
B-1071	oxyfluorfen	H-12
B-1072	saflufenacil	H-12
B-1073	sulfentrazone	H-12
B-1074	H-1	H-12
B-1075	H-2	H-12
B-1076	glyphosate	H-12
B-1077	glyphosate-isopropylammonium	H-12
B-1078	glyphosate-trimesium (sulfosate)	H-12
B-1079	glufosinate	H-12
B-1080	glufosinate-ammonium	H-12
B-1081	pendimethalin	H-12
B-1082	trifluralin	H-12
B-1083	acetochlor	H-12
B-1084	cafenstrole	H-12
B-1085	dimethenamid-P	H-12
B-1086	fentrazamide	H-12
B-1087	flufenacet	H-12
B-1088	mefenacet	H-12
B-1089	metazachlor	H-12
B-1090	metolachlor-S	H-12
B-1091	pyroxasulfone	H-12
B-1092	isoxaben	H-12
B-1093	dymron	H-12
B-1094	indanofan	H-12
B-1095	oxaziclomefone	H-12
B-1096	triaziflam	H-12
B-1097	atrazine + H-1	H-12
B-1098	atrazine + glyphosate	H-12
B-1099	atrazine + mesotrione	H-12
B-1100	atrazine + nicosulfuron	H-12
B-1101	atrazine + tembotrione	H-12
B-1102	atrazine + topramezone	H-12
B-1103	clomazone + glyphosate	H-12
B-1104	diflufenican + clodinafop-propargyl	H-12
B-1105	diflufenican + fenoxaprop-P-ethyl	H-12
B-1106	diflufenican + flupyr-sulfuron-methyl-sodium	H-12
B-1107	diflufenican + glyphosate	H-12
B-1108	diflufenican + mesosulfuron-methyl	H-12
B-1109	diflufenican + pinoxaden	H-12
B-1110	diflufenican + pyroxsulam	H-12
B-1111	flumetsulam + glyphosate	H-12
B-1112	flumioxazin + glyphosate	H-12
B-1113	imazapic + glyphosate	H-12
B-1114	imazethapyr + glyphosate	H-12
B-1115	isoxaflutol + H-1	H-12
B-1116	isoxaflutol + glyphosate	H-12
B-1117	metazachlor + H-1	H-12
B-1118	metazachlor + glyphosate	H-12
B-1119	metazachlor + mesotrione	H-12
B-1120	metazachlor + nicosulfuron	H-12
B-1121	metazachlor + terbuthylazine	H-12
B-1122	metazachlor + topramezone	H-12
B-1123	metribuzin + glyphosate	H-12
B-1124	pendimethalin + H-1	H-12
B-1125	pendimethalin + clodinafop-propargyl	H-12
B-1126	pendimethalin + fenoxaprop-P-ethyl	H-12
B-1127	pendimethalin + flupyr-sulfuron-methyl-sodium	H-12
B-1128	pendimethalin + glyphosate	H-12
B-1129	pendimethalin + mesosulfuron-methyl	H-12
B-1130	pendimethalin + mesotrione	H-12
B-1131	pendimethalin + nicosulfuron	H-12
B-1132	pendimethalin + pinoxaden	H-12
B-1133	pendimethalin + pyroxsulam	H-12
B-1134	pendimethalin + tembotrione	H-12
B-1135	pendimethalin + topramezone	H-12
B-1136	pyroxasulfone + tembotrione	H-12
B-1137	pyroxasulfone + topramezone	H-12
B-1138	sulfentrazone + glyphosate	H-12
B-1139	terbuthylazine + H-1	H-12
B-1140	terbuthylazine + foramsulfuron	H-12
B-1141	terbuthylazine + glyphosate	H-12
B-1142	terbuthylazine + mesotrione	H-12
B-1143	terbuthylazine + nicosulfuron	H-12
B-1144	terbuthylazine + tembotrione	H-12

TABLE B-continued

	Herbicide(s) B	Safener C
B-1145	terbuthylazine + topramezone	H-12
B-1146	trifluralin + glyphosate	H-12
B-1147	2-1	—
B-1148	2-2	—
B-1149	2-3	—
B-1150	2-4	—
B-1151	2-5	—
B-1152	2-6	—
B-1153	2-7	—
B-1154	2-8	—
B-1155	2-9	—
B-1156	2-1	benoxacor
B-1157	2-2	benoxacor
B-1158	2-3	benoxacor
B-1159	2-4	benoxacor
B-1160	2-5	benoxacor
B-1161	2-6	benoxacor
B-1162	2-7	benoxacor
B-1163	2-8	benoxacor
B-1164	2-9	benoxacor
B-1165	2-1	cloquintocet
B-1166	2-2	cloquintocet
B-1167	2-3	cloquintocet
B-1168	2-4	cloquintocet
B-1169	2-5	cloquintocet
B-1170	2-6	cloquintocet
B-1171	2-7	cloquintocet
B-1172	2-8	cloquintocet
B-1173	2-9	cloquintocet
B-1174	2-1	cyprosulfamide
B-1175	2-2	cyprosulfamide
B-1176	2-3	cyprosulfamide
B-1177	2-4	cyprosulfamide
B-1178	2-5	cyprosulfamide
B-1179	2-6	cyprosulfamide
B-1180	2-7	cyprosulfamide
B-1181	2-8	cyprosulfamide
B-1182	2-9	cyprosulfamide
B-1183	2-1	dichlormid
B-1184	2-2	dichlormid
B-1185	2-3	dichlormid
B-1186	2-4	dichlormid
B-1187	2-5	dichlormid
B-1188	2-6	dichlormid
B-1189	2-7	dichlormid
B-1190	2-8	dichlormid
B-1191	2-9	dichlormid
B-1192	2-1	fenchlorazole
B-1193	2-2	fenchlorazole
B-1194	2-3	fenchlorazole
B-1195	2-4	fenchlorazole
B-1196	2-5	fenchlorazole
B-1197	2-6	fenchlorazole
B-1198	2-7	fenchlorazole
B-1199	2-8	fenchlorazole
B-1200	2-9	fenchlorazole
B-1201	2-1	isoxadifen
B-1202	2-2	isoxadifen
B-1203	2-3	isoxadifen
B-1204	2-4	isoxadifen
B-1205	2-5	isoxadifen
B-1206	2-6	isoxadifen
B-1207	2-7	isoxadifen
B-1208	2-8	isoxadifen
B-1209	2-9	isoxadifen
B-1210	2-1	mefenpyr
B-1211	2-2	mefenpyr
B-1212	2-3	mefenpyr
B-1213	2-4	mefenpyr
B-1214	2-5	mefenpyr
B-1215	2-6	mefenpyr
B-1216	2-7	mefenpyr
B-1217	2-8	mefenpyr
B-1218	2-9	mefenpyr
B-1219	2-1	H-11
B-1220	2-2	H-11
B-1221	2-3	H-11
B-1222	2-4	H-11

TABLE B-continued

Herbicide(s) B		Safener C
B-1223	2-5	H-11
B-1224	2-6	H-11
B-1225	2-7	H-11
B-1226	2-8	H-11
B-1227	2-9	H-11
B-1228	2-1	H-12
B-1229	2-2	H-12
B-1230	2-3	H-12
B-1231	2-4	H-12
B-1232	2-5	H-12
B-1233	2-6	H-12
B-1234	2-7	H-12
B-1235	2-8	H-12
B-1236	2-9	H-12

The compounds of formula I and the compositions according to the invention may also have a plant-strengthening action. Accordingly, they are suitable for mobilizing the defense system of the plants against attack by unwanted microorganisms, such as harmful fungi, but also viruses and bacteria. Plant-strengthening (resistance-inducing) substances are to be understood as meaning, in the present context, those substances which are capable of stimulating the defense system of treated plants in such a way that, when subsequently inoculated by unwanted microorganisms, the treated plants display a substantial degree of resistance to these microorganisms.

The compounds of formula I can be employed for protecting plants against attack by unwanted microorganisms within a certain period of time after the treatment. The period of time within which their protection is effected generally extends from 1 to 28 days, preferably from 1 to 14 days, after the treatment of the plants with the compounds of formula I, or, after treatment of the seed, for up to 9 months after sowing.

The compounds of formula I and the compositions according to the invention are also suitable for increasing the harvest yield.

Moreover, they have reduced toxicity and are tolerated well by the plants.

USE EXAMPLES

The herbicidal activity of the compounds of the formula I was demonstrated by the following greenhouse experiments:

The culture containers used were plastic flowerpots containing loamy sand with approximately 3.0% of humus as the substrate. The seeds of the test plants were sown separately for each species.

For the pre-emergence treatment, the active ingredients, which had been suspended or emulsified in water, were applied directly after sowing by means of finely distributing nozzles. The containers were irrigated gently to promote germination and growth and subsequently covered with transparent plastic hoods until the plants had rooted. This cover caused uniform germination of the test plants, unless this has been impaired by the active ingredients.

For the post-emergence treatment, the test plants were first grown to a height of 3 to 15 cm, depending on the plant habit, and only then treated with the active ingredients which had been suspended or emulsified in water. For this purpose, the test plants were either sown directly and grown in the same containers, or they were first grown separately as seedlings and transplanted into the test containers a few days prior to treatment.

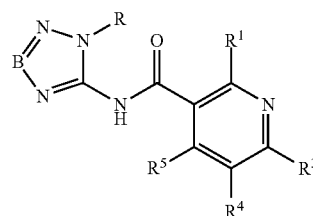
Depending on the species, the plants were kept at 10-25° C. or 20-35° C. The test period extended over 2 to 4 weeks.

During this time, the plants were tended, and their response to the individual treatments was evaluated.

Evaluation was carried out using a scale from 0 to 100. 100 means no emergence of the plants, or complete destruction of at least the aerial moieties, and 0 means no damage, or normal course of growth. A good herbicidal activity is given at values of at least 70 and a very good herbicidal activity is given at values of at least 85.

We claim:

1. A compound of formula I,



wherein

B is N;

R is selected from the group consisting of hydrogen, C₁-C₆-alkyl, C₃-C₇-cycloalkyl, C₃-C₇-cycloalkyl-C₁-C₄-alkyl, where the C₃-C₇-cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C₁-C₆-haloalkyl, C₂-C₆-alkenyl, C₂-C₆-haloalkenyl, C₂-C₆-alkynyl, C₂-C₆-haloalkynyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, C₁-C₄-haloalkoxy-C₁-C₄-alkyl, R^b-S(O)_n-C₁-C₃-alkyl, R^c-C(=O)-C₁-C₃-alkyl, R^dO-C(=O)-C₁-C₃-alkyl, R^eR^fN-C(=O)-C₁-C₃-alkyl, R^gR^hN-C₁-C₃-alkyl, phenyl-Z where phenyl is unsubstituted or substituted by 1, 2, 3 or 4 groups Rⁱ, which are identical or different;

R¹ is selected from the group consisting of cyano-Z¹, halogen, nitro, C₁-C₈-alkyl, C₂-C₈-alkenyl, C₂-C₈-alkynyl, C₁-C₈-haloalkyl, C₁-C₈-alkoxy, C₁-C₄-alkoxy-C₁-C₄-alkyl, C₁-C₄-alkoxy-C₁-C₄-alkoxy-Z¹, C₁-C₄-alkylthio-C₁-C₄-alkyl, C₁-C₄-alkylthio-C₁-C₄-alkylthio-Z¹, C₂-C₆-alkenyloxy, C₂-C₆-alkynyloxy, C₁-C₆-haloalkoxy, C₁-C₄-haloalkoxy-C₁-C₄-alkyl, C₁-C₄-haloalkoxy-C₁-C₄-alkoxy-Z¹, R^{1b}-S(O)_k-Z¹, phenoxy-Z¹, where the cyclic group in phenoxy is unsubstituted or substituted by 1, 2, 3 or 4 groups R¹¹, which are identical or different;

R³ is selected from the group consisting of hydrogen, halogen, OH-Z², NO₂-Z², cyano-Z², C₁-C₆-alkyl, C₂-C₈-alkenyl, C₂-C₈-alkynyl, C₃-C₁₀-cycloalkyl-Z², C₃-C₁₀-cycloalkoxy-Z², where the C₃-C₁₀-cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C₁-C₈-haloalkyl, C₁-C₈-alkoxy-Z², C₁-C₈-haloalkoxy-Z², C₁-C₄-alkoxy-C₁-C₄-alkoxy-Z², C₁-C₄-alkylthio-C₁-C₄-alkylthio-Z², C₂-C₈-alkenyloxy-Z², C₂-C₈-alkynyloxy-Z², C₂-C₈-haloalkenyloxy-Z², C₂-C₈-haloalkynyloxy-Z², C₁-C₄-haloalkoxy-C₁-C₄-alkoxy-Z², (tri-C₁-C₄-alkyl)silyl-Z², R^{2b}-S(O)_k-Z², R^{2c}-C(=O)-Z², R^{2d}O-C(=O)-Z², R^{2e}R^{2f}N-C(=O)-Z², R^{2g}R^{2h}N-Z², phenyl-Z^{2a} where the cyclic group in phenyl-Z^{2a} is unsubstituted or substituted by 1, 2, 3 or 4 groups R²¹, which are identical or different;

R⁴ is selected from the group consisting of hydrogen, halogen, cyano, nitro, C₁-C₄-alkyl and C₁-C₄-haloalkyl;

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R^5 is selected from the group consisting of halogen, C_1 - C_4 -alkyl and C_1 - C_4 -haloalkyl;
 n is 0, 1 or 2;
 k is 0, 1 or 2;
 R^i , R^{11} , R^{21} independently of each other are selected from the group consisting of halogen, NO_2 , CN, C_1 - C_6 -alkyl, C_3 - C_7 -cycloalkyl, C_3 - C_7 -halocycloalkyl, C_1 - C_6 -haloalkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -haloalkenyl, C_2 - C_6 -alkynyl, C_2 - C_6 -haloalkynyl, C_1 - C_6 -alkoxy, C_1 - C_4 -alkoxy, C_1 - C_4 -alkylthio- C_1 - C_4 -alkyl, C_1 - C_4 -haloalkoxy- C_1 - C_4 -alkyl, C_1 - C_4 -alkoxy- C_1 - C_4 -alkoxy, C_3 - C_7 -cycloalkoxy and C_1 - C_6 -haloalkyloxy, or two vicinal radicals R^i , R^{11} or R^{21} together may form a group =O;
 Z , Z^1 , Z^2 independently of each other are selected from the group consisting of a covalent bond and C_1 - C_4 -alkanediyl;
 Z^{2a} is selected from the group consisting of a covalent bond, C_1 - C_4 -alkanediyl, O - C_1 - C_4 -alkanediyl, C_1 - C_4 -alkanediyl-O and C_1 - C_4 -alkanediyl-O- C_1 - C_4 -alkanediyl;
 R^b , R^{1b} , R^{2b} independently of each other are selected from the group consisting of C_1 - C_6 -alkyl, C_3 - C_7 -cycloalkyl, C_1 - C_6 -haloalkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -haloalkenyl, C_2 - C_6 -alkynyl, C_2 - C_6 -haloalkynyl, and phenyl, where phenyl is unsubstituted or substituted by 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy and C_1 - C_4 -haloalkoxy;
 R^c , R^{2c} independently of each other are selected from the group consisting of hydrogen, C_1 - C_6 -alkyl, C_3 - C_7 -cycloalkyl, C_3 - C_7 -cycloalkyl- C_1 - C_4 -alkyl, where the C_3 - C_7 -cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C_1 - C_6 -haloalkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -haloalkenyl, C_2 - C_6 -alkynyl, C_2 - C_6 -haloalkynyl, C_1 - C_4 -alkoxy- C_1 - C_4 -alkyl, phenyl, and benzyl, where phenyl and benzyl are unsubstituted or substituted by 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy and C_1 - C_4 -haloalkoxy;
 R^d , R^{2d} independently of each other are selected from the group consisting of C_1 - C_6 -alkyl, C_3 - C_7 -cycloalkyl, C_3 - C_7 -cycloalkyl- C_1 - C_4 -alkyl, where the C_3 - C_7 -cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C_1 - C_6 -haloalkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -haloalkenyl, C_2 - C_6 -alkynyl, C_2 - C_6 -haloalkynyl, C_1 - C_4 -alkoxy- C_1 - C_4 -alkyl, phenyl and benzyl, where phenyl and benzyl are unsubstituted or substituted by 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy and C_1 - C_4 -haloalkoxy;
 R^e , R^f independently of each other are selected from the group consisting of hydrogen, C_1 - C_6 -alkyl, C_3 - C_7 -cycloalkyl, C_3 - C_7 -cycloalkyl- C_1 - C_4 -alkyl, where the C_3 - C_7 -cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C_1 - C_6 -haloalkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -haloalkenyl, C_2 - C_6 -alkynyl, C_2 - C_6 -haloalkynyl, C_1 - C_4 -alkoxy- C_1 - C_4 -alkyl, phenyl and benzyl, where phenyl and benzyl are unsubstituted or substituted by 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy and C_1 - C_4 -haloalkoxy;
 R^{2e} , R^{2f} independently of each other have the meanings given for R^e , R^f ;

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R^g is from the group consisting of hydrogen, C_1 - C_6 -alkyl, C_3 - C_7 -cycloalkyl, C_3 - C_7 -cycloalkyl- C_1 - C_4 -alkyl, where the C_3 - C_7 -cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C_1 - C_6 -haloalkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -haloalkenyl, C_2 - C_6 -alkynyl, C_2 - C_6 -haloalkynyl, C_1 - C_4 -alkoxy- C_1 - C_4 -alkyl, phenyl and benzyl, where phenyl and benzyl are unsubstituted or substituted by 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy and C_1 - C_4 -haloalkoxy;
 R^h is selected from the group consisting of hydrogen, C_1 - C_6 -alkyl, C_3 - C_7 -cycloalkyl, C_3 - C_7 -cycloalkyl- C_1 - C_4 -alkyl, where the C_3 - C_7 -cycloalkyl groups in the two aforementioned radicals are unsubstituted or partially or completely halogenated, C_1 - C_6 -haloalkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -haloalkenyl, C_2 - C_6 -alkynyl, C_2 - C_6 -haloalkynyl, C_1 - C_4 -alkoxy- C_1 - C_4 -alkyl, a radical $C(=O)-R^k$, phenyl and benzyl, where phenyl and benzyl are unsubstituted or substituted by 1, 2, 3 or 4 groups, which are identical or different and selected from the group consisting of halogen, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy and C_1 - C_4 -haloalkoxy;
 R^{2g} , R^{2h} independently of each other have the meanings given for R^g , R^h ;
 R^k has the meanings given for R^c ;
 an N-oxide or an agriculturally suitable salt thereof.
 2. The compound as claimed in claim 1, where R is selected from the group consisting of C_1 - C_4 -alkyl, C_1 - C_4 -alkoxy- C_1 - C_4 -alkyl, C_3 - C_7 -cycloalkyl, C_1 - C_4 -haloalkyl, $R^c-C(=O)-C_1$ - C_2 -alkyl, $R^dO-C(=O)-C_1$ - C_2 -alkyl, $R^eR^fN-C(=O)-C_1$ - C_2 -alkyl and $R^k-C(=O)NH-C_1$ - C_2 -alkyl, where
 R^c is C_1 - C_4 -alkyl or C_1 - C_4 -haloalkyl,
 R^d is C_1 - C_4 -alkyl,
 R^e is hydrogen or C_1 - C_4 -alkyl,
 R^f is hydrogen or C_1 - C_4 -alkyl,
 R^k is C_1 - C_4 -alkyl.
 3. The compound as claimed in claim 1, where R is phenyl, which is unsubstituted or substituted by 1, 2, 3 or 4 groups R^i , where R^i is selected from the group consisting of halogen, methyl, ethyl, methoxy and trifluoromethyl.
 4. The compound as claimed in claim 1, where R is $R^b-S(O)_n-C_1$ - C_2 -alkyl, where R^b is C_1 - C_6 -alkyl, C_1 - C_6 -haloalkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -haloalkenyl, C_2 - C_6 -alkynyl, C_2 - C_6 -haloalkynyl, or phenyl.
 5. The compound as claimed in claim 1, where R^1 is selected from the group consisting of cyano, halogen, nitro, C_1 - C_6 -alkyl, C_2 - C_6 -alkenyl, C_2 - C_6 -alkynyl, C_1 - C_6 -haloalkyl, C_1 - C_6 -alkoxy, C_1 - C_4 -alkoxy- C_1 - C_4 -alkyl, C_1 - C_4 -haloalkoxy- C_1 - C_4 -alkyl, C_1 - C_4 -alkoxy- C_1 - C_4 -alkoxy- Z^1 , C_1 - C_4 -alkylthio- C_1 - C_4 -alkyl, C_1 - C_4 -alkylthio- C_1 - C_4 -alkylthio- Z^1 , C_2 - C_6 -alkenyloxy, C_2 - C_6 -alkynyloxy, C_1 - C_6 -haloalkoxy, C_1 - C_4 -haloalkoxy- C_1 - C_4 -alkoxy and $R^{1b}-S(O)_k$, where R^{1b} is selected from C_1 - C_4 -alkyl and C_1 - C_4 -haloalkyl.
 6. The compound as claimed in claim 1, where R^1 is selected from the group consisting of halogen, CN, nitro, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy- C_1 - C_4 -alkyl, C_1 - C_4 -haloalkoxy- C_1 - C_4 -alkyl, C_1 - C_4 -alkoxy- C_1 - C_4 -alkoxy- C_1 - C_4 -alkyl, C_1 - C_4 -alkylthio- C_1 - C_4 -alkyl, C_1 - C_4 -alkylthio- C_1 - C_4 -alkylthio- C_1 - C_4 -alkyl, C_1 - C_4 -alkoxy- C_1 - C_4 -alkoxyloxy, C_3 - C_4 -alkenyloxy, C_3 - C_4 -alkynyloxy, C_1 - C_4 -alkoxy- C_1 - C_4 -alkoxy, C_1 - C_4 -haloalkoxy- C_1 - C_4 -alkoxy, C_1 - C_4 -alkyl-S(O)_k and C_1 - C_4 -haloalkyl-S(O)_k, where k is 0 or 2.

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7. The compound as claimed in claim 1, where R¹ is selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, C₁-C₄-alkoxy-C₁-C₄-alkoxy-C₁-C₄-alkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy, C₁-C₄-alkylthio, C₁-C₄-haloalkylthio and C₁-C₄-alkylsulfonyl.

8. The compound as claimed in claim 1, where R³ is selected from the group consisting of hydrogen, cyano, halo-
gen, nitro, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy,
C₁-C₄-haloalkoxy, C₂-C₄-alkenyl, C₂-C₄-alkynyl, C₂-C₄-
alkenyloxy, C₂-C₄-alkynyloxy and R^{2b}-S(O)_t.

9. The compound as claimed in claim 1, where R³ is selected from the group consisting of hydrogen, halogen, CN, NO₂, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy, C₁-C₄-alkylthio, C₁-C₄-haloalkylthio, C₁-C₄-alkylS(O)₂ and C₁-C₄-haloalkyl-S(O)₂.

10. The compound as claimed in claim 1, where R⁴ is selected from the group consisting of hydrogen, CHF₂, CF₃, CN, NO₂, CH₃ and halogen.

11. The compound as claimed in claim 1, where R⁵ is selected from the group consisting of CHF₂, CF₃ and halogen.

12. The compound as claimed in claim 1, where

R¹ is selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy-C₁-C₄-alkyl, C₁-C₄-alkoxy-C₁-C₄-alkoxy-C₁-C₄-alkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy, C₁-C₄-alkylthio, C₁-C₄-haloalkylthio and C₁-C₄-alkylsufonyl; and

R³ is selected from the group consisting of hydrogen, halogen, CN, NO₂, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy, C₁-C₄-haloalkylthio and C₁-C₄-alkylsulfonyl.

13. The compound as claimed in claim 1, where the variables R, R¹, R³, R⁴ and R⁵ have the following meanings:

R is C₁-C₄-alkyl;

R¹ is selected from the group consisting of halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl and C₁-C₄-alkyl-S(O)₂;

R³ is selected from the group consisting of halogen, CN, C₁-C₄-haloalkyl and C₁-C₄-alkyl-S(O)₂;

R⁴ is selected from the group consisting of hydrogen, CN, CHF₂, CF₃, CH₃, NO₂ and halogen,

R⁵ is selected from the group consisting of halogen, CHF₂ and CF₃.

14. The compound as claimed in claim 1, where the variables R, R¹, R³, R⁴ and R⁵ have the following meanings:

R is selected from the group consisting of methyl and ethyl;

R¹ is selected from the group consisting of chlorine, methyl, trifluoromethyl and methylsulfonyl;

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R³ is selected from the group consisting of fluorine, chlorine, trifluoromethyl, CN and methylsulfonyl; and R⁴ is hydrogen and R⁵ is chlorine or fluorine.

15. The compound as claimed in claim 1, where the radicals R¹, R³, R⁴ and R⁵ together form one of the following substitution patterns:

2-Br-4,6-Cl₂, 2,4-Cl₂-6-CN, 2,4,6-Cl₃, 2,4-Cl₂-6-F, 2,4-Cl₂-6-CF₃, 2,4-Cl₂-6-S(O)₂CH₃, 2-CF₃-4-Cl-6-CN, 2-CF₃-4,6-Cl₂, 2-CF₃-4-Cl-6-CF₃, 2-CF₃-4-Cl-6-S(O)₂CH₃, 2-CF₃-4-Cl-6-F, 2-CH₃-4-Cl-6-CN, 2-CH₃-4,6-Cl₂, 2-CH₃-4-Cl-6-CF₃, 2-CH₃-4-Cl-6-S(O)₂CH₃, 2-CH₃-4-Cl-6-F, 2-S(O)₂CH₃-4-Cl-6-CN, 2-S(O)₂CH₃-4,6-Cl₂, 2-S(O)₂CH₃-4-Cl-6-CF₃, 2-S(O)₂CH₃-4-Cl-6-S(O)₂CH₃, 2-S(O)₂CH₃-4-Cl-6-F, 2-Cl-4-F-6-CN, 2-Cl-4-F-6-CF₃, 2-Cl-4-F-6-S(O)₂CH₃, 2,6-Cl₂-4-F, 2-Cl-4,6-F₂, 2-CF₃-4-F-6-CN, 2-CF₃-4-F-6-CF₃, 2-CF₃-4-F-6-S(O)₂CH₃, 2-CF₃-4-F-6-Cl, 2-CF₃-4,6-F₂, 2-CH₃-4-F-6-CN, 2-CH₃-4-F-6-CF₃, 2-CH₃-4-F-6-S(O)₂CH₃, 2-CH₃-4-F-6-Cl, 2-CH₃-4,6-F₂, 2-S(O)₂CH₃-4-F-6-CN, 2-S(O)₂CH₃-4-F-6-CF₃, 2-S(O)₂CH₃-4-F-6-S(O)₂CH₃, 2-S(O)₂CH₃-4-F-6-Cl, 2-S(O)₂CH₃-4,6-F₂, 2,5-Cl₂-6-CN, 2,5,6-Cl₃, 2,5-Cl₂-6-F, 2,5-Cl₂-6-CF₃, 2,5-Cl₂-6-S(O)₂CH₃, 2-CF₃-5-Cl-6-CN, 2-CF₃-5,6-Cl₂, 2-CF₃-5-Cl-6-CF₃, 2-CF₃-5-Cl-6-S(O)₂CH₃, 2-CF₃-5-Cl-6-F, 2-CH₃-5-Cl-6-CN, 2-CH₃-5,6-Cl₂, 2-CH₃-5-Cl-6-CF₃—, 2-CH₃-5-Cl-6-S(O)₂CH₃, 2-CH₃-5-Cl-6-F, 2-S(O)₂CH₃-5-Cl-6-CN, 2-S(O)₂CH₃-5,6-Cl₂, 2-S(O)₂CH₃-5-Cl-6-CF₃, 2-S(O)₂CH₃-5-Cl-6-S(O)₂CH₃, 2-S(O)₂CH₃-5-Cl-6-F, 2-Cl-5-F-6-CN, 2-Cl-5-F-6-CF₃, 2-Cl-5-F-6-S(O)₂CH₃, 2,6-Cl₂-5-F, 2-Cl-5,6-F₂, 2-CF₃-5-F-6-CN, 2-CF₃-5-F-6-CF₃, 2-CF₃-5-F-6-S(O)₂CH₃, 2-CF₃-5-F-6-Cl, 2-CF₃-5,6-F₂, 2-CH₃-5-F-6-CN, 2-CH₃-5-F-6-CF₃, 2-CH₃-5-F-6-S(O)₂CH₃, 2-CH₃-5-F-6-Cl, 2-CH₃-5,6-F₂, 2-S(O)₂CH₃-5-F-6-CN, 2-S(O)₂CH₃-5-F-6-CF₃, 2-S(O)₂CH₃-5-F-6-S(O)₂CH₃, 2-S(O)₂CH₃-5-F-6-Cl or 2-S(O)₂CH₃-5,6-F₂.

16. A composition comprising at least one compound as claimed in claim 1 and at least one auxiliary, which is customary for formulating crop protection compounds.

17. A method for controlling unwanted vegetation which comprises allowing a herbicidally effective amount of at least one compound as claimed in claim 1 to act on plants, their seed and/or their habitat.

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